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SWINGLE (R. U.). **Chlorotic dwarf of Eastern White Pine.**—*Plant Dis. Repr.*, xxviii, 26, pp. 824–825, 1944. [Mimeographed.]

Chlorotic dwarf of *Pinus strobus* is a chronic disease found since 1936 throughout Ohio and more recently in parts of Indiana and West Virginia. The condition also occurs in parts of Kentucky, Virginia, Delaware, Pennsylvania, Michigan, New York, and the New England States. It is prevalent in 2- to 15-year-old plantations in Ohio, and is probably the most important disease of white pine in this State. It is found in mixed and pure stands, but *P. strobus* is the only species affected. During 1943, 20 per cent. of the trees in one eight-year-old plantation in central Ohio were found to be attacked. As a rule, the decline lasts for three to five years or more, after which death ensues. Diseased trees are usually widely distributed, individually or in small groups, throughout affected plantations. These small groups often consist of trees in different stages of decline. Individual diseased trees surrounded by healthy ones commonly occur some distance away from other affected individuals. In one plantation, two trees were occasionally found planted together, one of which was healthy and the other diseased.

The condition is characterized by stunting of the roots and top and greenish-yellow to yellow foliage. In the early stages, needles formed the year before turn yellow and drop prematurely. The current year's needles are light green to yellowish-green and sometimes are reduced in length. In hot, dry periods they often develop tipburn.

Current growth of the central leader and lateral branches may be reduced. Each year, the dwarf symptoms become intensified. Dwarfing of the needles, the central leader, and the lateral branches becomes pronounced. The needles are greenish-yellow to yellow, and one-quarter to three-quarters normal size. Premature loss of year-old foliage continues, and tipburn of current needles is common. Annual growth of the central leader may vary from 0.5 to 6 in., as against 20 or 30 in. for near-by healthy trees. The bark of the upper trunk and branches is olive-green to yellow-green and somewhat wrinkled or shrivelled. Raised pitch pockets or blisters are generally present on the lower stem. There is no external flow of resin. In advanced stages, there is pronounced stunting of the roots. Fibrous roots are sparse and most of them are found in the upper 6 in. of soil. Experiments are in progress to determine whether the disease is infectious.

DAY (M. W.) & STRONG (F. C.). **A basal stem canker of Red Pine.**—Reprinted from *Quart. Bull. Mich. agric. Exp. Sta.*, xxvi, 4, 3 pp., 1 fig., 1944.

Red pines (*Pinus resinosa*) at the Dunbar Forest Experiment Station, near Sault Ste. Marie, Michigan, have been observed during the last three years to bear cankers on the stem bases, directly above the roots and at or slightly below soil-level. The tree is eventually girdled and gradually dies, its appearance in the summer preceding death being characterized by short, pale green needles on the current year's growth, retarded twig development, and a swelling of stem just

above the canker due to the interrupted transport of nutrients and their consequent accumulation in the tissues of this region. A considerable quantity of resin may be found on the surface of the canker. The disease is also present in a red pine plantation, dating from 1928, on poorly drained areas of an old field of Bruce sandy loam in Chippewa County, where the original cover appears to have consisted mainly of tamarack (*Larix laricina*) with an admixture of black spruce (*Picea mariana*).

The available information points to a weakly parasitic soil fungus as the agent of the canker, but so far the results of inoculation experiments with a *Coniothyrium* and a colourless, non-sporulating organism isolated from the diseased tissues have been negative.

BAXTER (D. V.). Some resupinate Polypores from the region of the Great Lakes.

XV.—*Pap. Mich. Acad. Sci.*, xxix (1943), Part I, pp. 85–109, 6 pl., 1944.

Continuing his critical studies on the resupinate Polypores of the Great Lakes region of the United States [*R.A.M.*, xxii, p. 334], the author discusses the damage inflicted, notably in the tropics, by the white group of wood-destroying fungi (*Poria*, *Trametes*, and *Polystictus* spp.) on timber used for military purposes. Long periods of transit are inevitable in war time, while the methods of handling war material are increasing in complexity, so that information is urgently required concerning the growth rate of these pathogens and the conditions favouring their development. Two further groups, the brown lignicolous fungi and those other than white or brown, are reserved for subsequent investigations.

The initial classification of a fungus, on the basis of its mycelial characters, is made by a comparison of the unknown culture with a stock collection from named species, but the number of resupinate Polypores that has been assembled from the vast area of the North American continent is still far from complete, involving the risk that a particular unidentified species may not yet be represented among the available material. Moreover, if pore formation does not occur in an isolate from wood, it may not be a Polypore but a representative of some other family, such as the Thelephoraceae. The five cases of flask cultures of various fungi on red gum [*Liquidambar styraciflua*] test pieces, duplicated on white pine blocks, comprised in the collection of the School of Forestry and Conservation of the University of Michigan, has been found most useful for comparative purposes.

Wherever possible, the determination of a species should be based on structures of the fruiting body, whereas cultures are particularly helpful in race identification. In the compilation of a key, the microscopic elements possess the advantage of relative stability over such features as colour, texture, and growth rate and form, while further important characters are the presence or absence of clamp-connexions, chlamydospores, conidia or oidia, staghorn and other types of mycelial branching, hyphal diameter, setal hyphae, and setae. In the white group of Polypores under investigation, however, clamp-connexions are of such general occurrence as to afford little help in the construction of a key. They are almost invariably absent, on the other hand, from the brown group, but the white and brown Polyporaceae are so easily distinguishable on a colour basis alone as to obviate the need for microscopic examination of the mycelium. For specific differentiation within the brown or white groups microscopic structures, such as the spines on the mycelium of *Poria spiculosa* [ibid., xxi, p. 270], provide definite criteria. The use of certain other microscopic characters may be limited by variations in their incidence associated with environmental factors, e.g., the age of the culture, thickness of the medium, and degree of prevailing humidity, the last-named being well known to influence not only the abundance but the type of spore production.

Turning to physiological reactions, the Bavendamm oxidase test, involving the addition to malt agar cultures of 0.5 per cent. tannic or gallic acid [cf. ibid., viii,

p. 281], may prove helpful in the separation of brown- from white-rotting fungi; the method, however, is time-consuming and laborious, and a decision as to the colour of the decay may usually be reached by examination of the wood from which the isolation was made. Records of data on growth rate, mycelial development on wood, and the effect of the fungus on its host are of value not only for identification purposes in a key, but also from the pathological standpoint. If wood-block cultures are not available for comparative studies, the microscopic and other features enumerated in the key are, for the most part, typical of the fungus in fortnight-old Petri dish cultures. In cultures of *Fomes annosus* the almost invariable occurrence of conidiophores with spiked heads, discernible under the microscope, is a distinctive specific character which is used as the first element in the separation of this fungus from other members of the white group.

A key is appended, based on Petri dish and one-year-old wood-block cultures, of the principal white resupinate Polypores of the Great Lakes region.

DILLON WESTON (W. A. R.). **Club root disease.**—*J. Minist. Agric.*, li, 9, pp. 420–422, 9 figs., 1944.

A brief, popular account is given of the symptoms and control of club root of crucifers caused by *Plasmodiophora brassicae* [*R.A.M.*, xxiii, p. 283]. It is recommended that roots of all affected plants should, if possible, be burnt. Where this is not possible, rotted roots and dung from animals fed on a diseased crop must not be placed on the manure heap; a diseased root crop should be fed off on the affected field or it may be taken to a permanent pasture or a field that is unlikely to be broken up for some years. Affected soil should be treated with freshly slaked burnt lime, hydrated lime, or ground quicklime, applied as soon as the crop is cleared and intimately mixed with the soil. A cruciferous crop should not be planted for a long time, and acid fertilizers should be avoided.

GIDDINGS (N. J.). **Additional strains of the Sugar-Beet curly top virus.**—*J. agric. Res.*, lxix, 4, pp. 149–157, 4 figs., 1944.

Six additional strains of the sugar beet curly-top virus [*R.A.M.*, xvii, p. 786] have now been segregated, using 47 plant species and varieties as differential hosts, besides numerous varieties of cultivated sugar beet. Strains 5, 6, and 10 were obtained in 1937 from *Nicotiana glauca* which had grown in natural breeding areas of *Eutettix tenellus*, near Tracy, California. Strain 7 was obtained from diseased spinach in a commercial field west of Hemet, California. Strain 8 came under test in 1936 as a result of inoculations by J. M. Wallace on Red Mexican bean (*Phaseolus vulgaris*) with a colony of viruliferous leafhoppers carrying a mixture of unknown virus strains. Strain 9 was obtained earlier from a similar colony by inoculations on a resistant beet.

Inoculations into young susceptible beets with strains 5 and 6 gave little or no distortion of the leaves, which in many cases were deep green. Extreme dwarfing resulted, with a very high percentage of mortality. Strain 5 was most readily differentiated from strain 6 by the more severe symptoms the former induced on Turkish tobacco. Strain 5 also appeared to be more virulent than strain 6 on *N. glutinosa*, whereas strain 6 seemed more virulent than strain 5 when inoculated into Red Mexican bean, University of Idaho No. 15 selection of Great Northern bean, and the highly resistant sugar beet variety 68. Strain 7 is the least virulent of all those so far selected; it is the only strain that has produced no symptom on sugar beet 68. It does not infect Turkish tobacco and seldom infects *N. glutinosa*. Nevertheless, this strain caused considerable injury. Strains 8 and 9 showed similar virulence on most host plants tested, but strain 9 infected a higher percentage of beet 68 than strain 8 and produced more severe symptoms on Red Mexican bean. Strain 10, when inoculated into young susceptible sugar beet

plants, produced symptoms like those of strains 5 and 6, but much less severe, very few of the infected plants dying. The general host range was found to be the same as that of strains 5 and 6, but the symptoms were less severe on all of them, with the possible exception of tomato.

Each of these strains showed a high degree of stability, though any one could induce symptoms distinctly different in severity. For instance, 20 susceptible plants infected by strain 7 and kept under identical environmental conditions might show three or four plants with symptoms graded 2, a few graded 1·5, and the rest 1. Arrangement of the strains according to ascending amount of injury on susceptible sugar beet would be approximately 7, 2, 4, 10, 1, 8, 3, 9, 5, 6, and on resistant beet 68 would be 7, 10, 3, 8, 5, 6, 4, 2, 9, 1. Strains 2, 4, and 7 in no case produced symptoms on Turkish tobacco, on which strain 10 gave mild symptoms, strain 6 rather severe symptoms, and strains 1, 3, 5, 8, and 9 very severe symptoms.

The 10 strains described are considered to form part of a much larger group with the same vector, host range, and symptoms, which may be designated *Ruga verrucosans* Carsner and Bennett. Owing to their common characteristics, however, and also as a matter of convenience, it seems best to refer to them by strain number.

MURPHY (A. M.). **Production of heavy curly-top exposures in Sugar-Beet breeding fields.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 459–462, 1943.

Brief notes are given on five general methods of experimentally inducing curly-top epidemics in sugar beet-breeding fields, viz., (1) caging leafhoppers on beets, a laborious, expensive, and slow method; (2) planting diseased mother beets, open to the danger that these may have mosaic or other diseases; (3) releasing viruliferous leafhoppers, the chief difficulty with this method being to obtain adequate numbers of the insects; (4) interplanting with a susceptible variety, or when the vector is prevalent with a variety of intermediate resistance able to persist longer, and (5) late planting. Another method now being tested is to increase the exposure to curly top by providing suitable host plants (either wild or cultivated) to harbour the leafhoppers over the winter. The seed of weed hosts, such as mustard, is planted during autumn in or near the field that is next to be used for the sugar beet-breeding plots. As a cultivated host plant, spinach has given promising results. The yields of the varieties R. & G. Old Type, U.S.1, U.S.33, U.S.12, U.S.22, and Improved U.S.22 under drastic test in Idaho in 1941 were 0·73, 6·31, 8·40, 11·25, 14·32, and 16·61 tons per acre, respectively [cf. *R.A.M.*, xxi, p. 316]. As the severity of curly top varies widely from year to year it is unwise to depend entirely upon natural infestation in breeding tests.

BREWBAKER (H. E.). **Mosaic and seed production.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 381–385, 1943.

In a three-year study of the effect of mosaic on seed production by sugar beets [*R.A.M.*, xxii, p. 236], 1,461 plants were classified for mosaic on the basis of no infection, light, medium, and heavy, and for weight of seed per plant, germination, and number of seedballs per ounce of seed. Excluding two lots that failed to germinate, the results showed that for the four classes, respectively, the average weight of seed per plant was 5·75, 5·52, 4·75, and 3·95 oz., the percentage germination 80·4, 80·9, 77·5, and 75·1, and the average number of seedballs per ounce of seed 1,747, 1,775, 1,825, and 1,836. In weight of seed per plant the average loss due to light, medium, and heavy mosaic was, respectively, 4, 17·4, and 31·3 per cent., while for medium and heavy infection the loss in average germination was 3·6 and 6·6 per cent., respectively. The seedball count per ounce of seed increased in almost direct proportion to the decrease in germination. It is concluded that

in any sugar beet improvement programme the seed-production work should be segregated some distance from the testing and selection plots in areas where mosaic is present.

ISAKSSON (A.). **A *Botrytis* form causing storage rot in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 423-430, 3 figs., 1943.

In 1941, a disease previously not recorded by the Great Western Sugar Company and possibly new to the sugar beet industry as a whole was found on the roots of sugar beet in a storage cellar at Longmont, Colorado. Most of the beets had been tested for sugar content and it was evident that the wounds caused by the test drill or by carving out diseased tissue from moderately affected roots, as well as broken root-tips, served as the preferred mode of entry. Diseased roots showed a uniform invasion and discoloration of the tissues followed by a general collapse. Isolations from affected material yielded a *Botrytis* of the *B. cinerea* type. Wound inoculations, with resulting rot and recovery of the fungus, showed that it was strongly pathogenic to sugar beet roots under the experimental conditions.

LEACH (L. D.) & BAINER (R.). **Seed treatment of segmented seed.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 220-227, 5 graphs, 1943.

Experiments carried out in California in the greenhouse to determine the protective and toxic effects of fungicidal treatments of segmented sugar beet seed demonstrated that such seed responds similarly to whole seed, but requires a rather higher dosage. Even under moderately severe infestation of the soil by *Pythium ultimum* and *Rhizoctonia* [*Corticium*] *solani* a 1.5 per cent. dosage of ceresan or a 0.5 per cent. one of new improved ceresan should afford adequate protection. Red copper oxide and sperton were less effective.

BUCHHOLTZ (W. F.). **Crop rotation and soil drainage effects on Sugar Beet tip rot and susceptibility of other crops to *Aphanomyces cochlioides*.**—*Phytopathology*, xxxiv, 9, pp. 805-812, 1 fig., 1 diag., 1944.

The high incidence of sugar beet tip rot (*Aphanomyces cochlioides*) in some fields and its virtual absence from others in Hancock County, Iowa, during 1937, 1938, and 1939 [*R.A.M.*, xxiii, pp. 464, 469] suggested an investigation of the reactions to the pathogen of certain crops commonly grown in rotation with beets, namely, maize, oats, soy-beans, lucerne, and sweet clover [*Melilotus*], and of the relation of the disease to the position of tile drains. None of these crops contracted the rot in infected soil, while in another series of tests barley and red clover also remained free from the fungus, which did, however, attack two ubiquitous weeds, pigweed (*Amaranthus retroflexus*) and lamb's quarters (*Chenopodium album*); flax sustained a reduction of germination in one experiment, but gave no evidence of susceptibility in another.

It was observed in fields with a varying incidence of tip rot that in no case did the disease affect the first beet crop in a given field, that the third crop in eight years or less suffered severe damage, and that beets following lucerne were uniformly free from severe infection by *A. cochlioides*. On the basis of these data it was concluded that three-to-four-year intervals between beet crops should ordinarily prevent heavy losses from tip rot, though an intervening period of six or more years, including three or four seasons of lucerne, may be a wise precaution in a field where the disease has been virulent.

A definite connexion between the proximity of tile drains and less than the average incidence of tip rot was established at Kanawha in 1938, while a relationship was indicated, but not definitely established, between excessive soil moisture and the severity of the fungus.

AFANASIEV (M. M.), MORRIS (H. E.), & CARLSON (W. E.). **The effect of preceding crops on the amount of seedling diseases of Sugar Beets.**—Abs. in *Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 435–436, 1943.

In this abstract the authors give the results of field and greenhouse investigations of the effect of continuous fallow and of oats, maize, beans, potatoes, beets, and lucerne on the development of seedling diseases of sugar beets. The soil, from a field cropped for three years with lucerne, was planted to beets in the greenhouse to test its disease potentialities. The beets were harvested when the third pair of leaves were developed, and the crops listed above were then planted in the soil and harvested in about three months, after which the soil was again sown to beets. Readings of healthy and diseased beet seedlings were made at frequent intervals.

On an average for two years, the least amount of seedling diseases (23.6 per cent.) occurred after maize, and the highest (87.8 per cent.) in the control. Seedling diseases of beets occurred in progressively increasing amounts as the beets were planted after maize, potatoes, lucerne, beans, beets, and the control, respectively.

In field studies, sugar beets planted in uniform soil in which potatoes, beans, beets, and lucerne had grown for five years showed the smallest incidence of seedling diseases (11.1 per cent.) following potatoes and the greatest following beets (74.2 per cent.) and lucerne (61.2 per cent.). Beets after beans showed 27.7 per cent. disease. From each plot 250 beet seedlings were analysed for nitrogen and phosphorus, and it was found that both decreased as seedling diseases increased; the highest amounts of these elements were found in the beets on the potato plot and the smallest on the beet plot.

AFANASIEV (M. M.) & CARLSON (W. E.). **The relation of phosphorus and nitrogen ratio to the amount of seedling diseases of Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 407–411, 1 graph, 1943.

In an investigation under greenhouse conditions of the effect of different phosphorus to nitrogen ratios on the development of young sugar beets and on the occurrence of diseases among them [cf. *R.A.M.*, xxi, p. 510; xxii, p. 508], a basic application was made of 20.8 lb. treble superphosphate containing 9.6 lb. phosphorus, and 62.3 lb. calcium nitrate containing 9.6 lb. nitrogen, or equivalent amounts of ammonium sulphate were used per acre as a side-dressing. After this, three different series of ratios were used: treble superphosphate in combination with calcium nitrate, treble superphosphate with ammonium sulphate, and treble superphosphate, ammonium sulphate, and manure (16 tons per acre). In each series there were seven different phosphorus (P_2O_5):nitrogen ratios, i.e., 0:3, 1:3, 1:2, 1:1, 2:1, 3:1, 3:0, and 0:0.

The results showed that seedling-disease incidence was lowest with treble superphosphate, ammonium sulphate, and manure, and highest with treble superphosphate and ammonium sulphate. There was a high correlation of the amount of seedling diseases in individual ratios in all series. The lowest amount was in the P:N ratios of 1:3 and 1:2 and the highest in the 3:0 and the control. The heaviest plants in all series were in the P:N ratios 1:3 and 1:2, and the smallest in the ratios 0:3 without manure, 3:0, and the control.

When calcium nitrate was incorporated in the fertilizer the amount of seedling disease was less than when ammonium sulphate was used and under field conditions the difference would probably be greater. When manure was added to artificial fertilizer the amount of disease was low in all ratios.

The data show the importance of balanced fertilization both as an aid in controlling seedling diseases of sugar beets and as a means of securing maximum yield under given environmental conditions.

SERGEANT (M. W.). **The effect of field conditions and of field practices on the development of black root in Sugar Beets.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, p. 466, 1943.

A study of 124 sugar beet fields affected with black root in 1939, 1940, and 1941 showed that fields planted late or replanted and those with low fertility or poor drainage showed relatively poor recovery from black root. The percentage saved was highest after cultivated crops of the kinds that are generally fertilized, such as many beans, potatoes, tomatoes, etc.; next in value came legumes, maize, and small grains; beets after beets were a total loss.

Among remedial treatments, immediate aeration with a rotary hoe, weeder, or spike-tooth harrow saved 68 per cent. of the crop, the use of a roller or cultipack saved 34 per cent., delayed treatment of any kind saved 24 per cent., and no treatment resulted in a loss of all but 13 per cent.

COONS (G. H.), KOTILA (J. E.), & BOCKSTAHLER (H. W.). **Black root diseases of Sugar Beet in 1941.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 436-437, 1943.

In experiments on the control of seedling diseases of sugar beet at East Lansing, Michigan, in 1941, seed treatment with commonly used mercury and copper disinfectants gave significantly better initial stands, but enough plants were available at thinning in the untreated plots to give a subsequent yield of roots not significantly below the treated.

In a crop-sequence test at Holgate, Ohio, stands of sugar beet following soy-beans or clover were significantly better than those following sweet clover [*Melilotus*], but the stand in this last sequence was adequate. Acre-yields of roots when sugar beets followed sweet clover or soy-beans were better than when the first-named followed maize, but the quality of the roots following maize compensated for the reduced yields. The experiment again demonstrated the beneficial effect of a preceding maize crop in repressing pathogenic organisms which attack young sugar beets.

GREEN (J.). **Phosphorus and nitrogen deficiency symptoms in Sugar Beets.**—*Proc. Amer. Soc. Beet Technol.*, 1942, pp. 101-102, 1943.

Combined deficiency of phosphorus and nitrogen produces typical bronzing in leaves of sugar beet. Analyses of affected and normal leaves showed the former to contain 1.129 gm. nitrogen and 0.159 gm. phosphorus as against 1.826 and 0.276 gm., respectively, for the latter. Bronzing occurs on individual beets scattered about the field, which show a genetic weakness or are unable to thrive on a given level of plant food. The apparently normal beets in the same field have grown under the same limited conditions, but without developing bronzing. The small average showing extreme deficiency of either element or both gives growers serious concern, but the large area over which moderate deficiencies occur presents a graver problem, because here, though the yield may be reduced by only two to four tons an acre, the total loss is great.

COONS (G. H.), STEWART (D.), CULBERTSON (J. O.), DEMING (G. W.), GASKILL (J. O.), LILL (J. G.), & NUCKOLS (S. B.). **Report on 1941 tests of U.S.200 × 215, U.S.215 × 216, and other varieties arising in leafspot-resistance breeding investigations of the U.S. Department of Agriculture.**—*Proc. Amer. Soc. Sug. Beet Technol.*, 1942, pp. 356-364, 1943.

During 1941, further agronomic evaluation tests were carried out on U.S.200 × 215 and allied varieties of sugar-beet arising in breeding work for leaf spot [*Cercospora*

beticola] resistance [cf. *R.A.M.*, xxi, p. 114]. The results showed that in the absence of leaf spot, the Synthetic Check variety is a strong competitor to U.S.200×215, but it falls below the latter when leaf spot is present. The new variety U.S.215×216 was found to be more resistant and higher in sucrose than U.S.200×215, and it may well replace the latter as seed stocks become available. U.S.216×a high-yielding, moderately resistant inbred (8-266-0) and U.S.215×8-419-0, a high-sucrose and highly resistant selection from Rovigo-581 showed excellent promise.

In general, the results showed that many varieties, including those arising in the breeding work of sugar beet companies, are reaching a high level of resistance to leaf spot and are making an excellent showing. In many cases, tests of greater precision, carried out over a long period, will be required before it can be decided which are the most outstanding. In areas where leaf spot is prevalent, breeding work must concentrate on the attainment of high resistance without loss of high productivity.

PERSON (L. H.). **The occurrence of a variant in *Rhizoctonia solani*.**—*Phytopathology*, xxxiv, 8, pp. 715-717, 1 fig., 1944.

A sector variant in an isolate of *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, xviii, p. 494] from beans at Baton Rouge, Louisiana, was compared with the original culture on bean pod agar at a temperature range of 15° to 34° C. in respect of growth rate and pathogenicity. The parent developed more rapidly than the mutant at 20° and 24°, at about the same rate at 29°, and rather more slowly at 34°, the diameter of the former after 50 hours at the four temperatures (average of two tests) being 59, 88, 83, and 65 mm., respectively, while the corresponding dimensions for the latter were 47, 76, 83, and 69 mm., respectively. The variant was less pathogenic than the original culture to beans and other legumes, judging both by the severity of stem lesions and the percentage of stands in inoculated soil. Thus, taking 0 to represent no lesions and 4 to indicate destruction of the plants, the degrees of infection by the parent and mutant were 2·21 and 1·01 for beans planted in inoculated soil and 3·13 and 1·69 for the same host in soil inoculated after emergence, the stand percentages being 52 and 69, respectively, compared with 84 for the controls. In further tests, the stand percentages (average of two tests of 100 seeds each) of beans, soy-beans, cowpeas, and English peas in soil inoculated with the parent culture were 63, 1, 40, and 0, respectively, the corresponding figures for the variant being 78, 36, 76, and 81, and for the controls 92, 56, 94, and 94, respectively.

SMITH (M. A.). **Bacterial soft rot of Spinach.**—*Phytopathology*, xxxiv, 8, pp. 747-752, 1 fig., 1944.

Between 1936 and 1943 bacterial soft rot of spinach was responsible for the bulk of the decay in consignments of this product from all regions inspected at Chicago, averaging 40 per cent. for each carload. The results of comparative morphological, cultural, biochemical, and pathogenic studies to verify the common assumption that the agent of the disease is *Erwinia carotovora* using three isolates from spinach and two authentic isolates of *E. carotovora* from potato, indicated that this species is concerned in the rot of both vegetables, differences in carbon metabolism of the spinach organism (failure to ferment maltose, sorbitol, and dulcitol) being insufficient to justify its differentiation from the *E. carotovora* isolates. Isolates from rotted spinach proved to be capable of attacking potatoes. In the case of spinach infection may occur either through injured or uninjured leaves. The disease may be combated in transit and marketing by the maintenance for eight days of a temperature of 4·5° C.

ASKEW (H. O.). **A case of combined potassium and boron deficiencies in Grapes.**—*N.Z.J. Sci. Tech.*, A, xxvi, 3, pp. 146–152, 3 figs., 1944.

Chlorosis, followed first by a reddish- and then by a purplish-brown discoloration and collapse, of Albany Surprise vine leaves growing on a poor phase of the Moutere clay-loam soil type at Braeburn, Nelson, New Zealand, was found to be caused by potash deficiency. It was successfully treated during the seasons of 1941–2 and 1942–3 by applications of potassium sulphate at the rate of 4 cwt. per acre. A browning and shrivelling of the flesh of the berries on the same vines was cured by the inclusion of borax (28 lb. per acre) in the fertilizer [*R.A.M.*, xxii, p. 126]. To cite some figures from the chemical analyses, the potash contents of the leaves of vines treated with (1) potassium sulphate and (2) the same plus boron were raised from 0.32 to 0.54 and 0.66 p.p.m., respectively, in 1941–2, the corresponding figures for 1942–3 being from 0.49 to 0.83 and 0.93 p.p.m., respectively. The boron contents of berries receiving (1) boron and (2) the same plus potassium sulphate were increased from 4.4 to 15 and 26.6 p.p.m., respectively, in 1941–2, and from 8.8 to 21.6 and 33.9 p.p.m., respectively, in 1942–3.

MCCUBBIN (W. A.). **Air-borne spores and plant quarantines.**—*Sci. Mon.*, N.Y., lix, 2, pp. 149–152, 1944.

The author discusses and illustrates by theoretical calculations and concrete examples the possibilities of long-distance spread of parasitic fungi by means of air-borne spores [cf. *R.A.M.*, xxiii, p. 310] in relation to the efficiency of plant quarantines in their exclusion from the United States. Of the 200 representative diseases already assembled in connexion with another plant-quarantine study, 75 to 90 per cent. appear to be incapable of more than limited or local dissemination through the air, while even for the few species possessed of the necessary qualifications for transmission over wide areas a series of hazards is involved which greatly reduces the likelihood of success. The value of the quarantine effort remains unimpaired by the remote possibility of intercontinental air-borne spore dissemination, the primary object of the legislative machinery being the prevention of disease and insect introduction from overseas by vigilant attention to the controllable channels of human travel and commerce.

WILLIAMS (P. H.), SHEARD (ENID), READ (W. H.), & SELMAN (I. W.). **Mycological Report.**—*Rep. exp. Res. Sta. Cheshunt*, 1943, pp. 28–52, 4 graphs, 1944.

In this report [cf. *R.A.M.*, xxii, p. 466] P. H. Williams states that cultures of various strains of *Verticillium*, viz., Nos. 19 (reisolation from a tomato of a type culture of *V. dahliae* from Baarn), 24 (reisolation from tomato of *V. 243* [loc. cit.]), 25 (reisolation from tomato of a type culture of *V. albo-atrum* from Baarn), and 30, 33, 34, and 36 (cultures isolated from tomato in 1942), fell into two groups. In group 1, consisting of strains 25, 30, and 33, the mycelium was at first white, but later became dark owing to the production of carbonized hyphae and to the brown bases of the conidiophores, while in group 2, comprising strains 19, 24, 34, and 36, definite microsclerotia were formed. The fungi in group 1 are referred to *V. albo-atrum* and those in group 2 to *V. dahliae*. So far 11 strains of the former and four of the latter have been isolated by the writer from tomatoes in England.

The optimum temperature for the development of *V. albo-atrum* was about 25° C. and its maximum temperature slightly over 30°. The corresponding figures for *V. dahliae* were between 25° and 30° and over 30°. It appears likely that an average temperature of 25°, as recommended for the control of *V. albo-atrum*, would have no effect on *V. dahliae* and might even favour infection.

When Ailsa Craig and Riverside tomatoes were inoculated with different strains of *V. dahliae* and *V. albo-atrum*, Riverside was less resistant than Ailsa Craig, but when the experiment was repeated under apparently identical conditions, the

reverse obtained. It is concluded that some control of such factors as temperature and humidity is necessary before reliable results can be obtained by this method.

E. Sheard states that tomato stem rot due to *Didymella lycopersici* became increasingly severe and widespread on glasshouse crops in 1943, particularly in the southern counties. *D. lycopersici* was more virulent when it had overwintered out of doors than when it had been kept at about 59° F.

When tomato seeds were sown in sterilized soil to which cultures of *D. lycopersici* had been added, after four weeks none of the plants showed infection. Seedlings from recently germinated seeds did not become infected when sprayed with a spore suspension of the fungus in water. In another experiment large plants bearing trusses of fruit were more susceptible than plants in the propagatory stages. In practice the disease seldom occurs until the plants are in the borders and carrying one or two trusses. When infected seed was sown in sterilized soil, none of the seedlings showed the disease. The practice of raising healthy plants from infected seed is, however, most undesirable.

In inoculation tests the only plant other than tomato found to be readily susceptible to *D. lycopersici* was eggplant. Wounded stems of *Solanum nigrum* became infected, with resultant death of the plants. Potato haulms inoculated at the beginning of July did not develop infection, but when the plants were inoculated in October, the haulms became infected and died. Wounded haulms were more susceptible than unwounded. A slight infection was obtained on wounded stems of *Nicotiana glutinosa* and tobacco. Experimental evidence indicated that *D. lycopersici* may exist saprophytically on various materials commonly present in nurseries.

The optimum growth temperature for the fungus in pure culture was found to be about 20° C.; it was able to survive short periods at 35°, and was resistant to a temperature of -10°.

W. H. Read found that in most cases of stem rot due to *D. lycopersici* the plants were attacked at the base of the stem, usually immediately above soil-level, but occasionally below, suggesting that the fungus was present either within or on the surface of the soil. The spores may perhaps be carried into glasshouses by air currents, and the attack take place at soil-level because conditions are most suitable there.

Soil sterilization with formaldehyde and a tar acid failed to give adequate control. Base of stem treatments with 0.5 per cent. salicylanilide gave marked reduction in infection, and work in this direction is to be continued.

It was found that spores which had emerged from pycnidia were destroyed when sulphur was burnt at the rate of 1 lb. per 1,000 cu.ft. of glasshouse capacity. Spores within pycnidia on the stems of diseased plants were not killed, however, so that one such fumigation will not completely disinfect the superstructure of a glasshouse, since viable spores will be liberated from diseased stems when the old plants are removed. After removal of old plants, the houses should be sprayed with a 1 in 50 solution of 40 per cent. formaldehyde or a tar acid fluid at the same strength. Where the houses are free from cracks, sulphur can again be burnt at the rate of 1 lb. per 1,000 cu.ft.

P. H. Williams and E. Sheard state that during 1943 a new type of tomato stem rot was observed, caused by *Phytophthora parasitica* [ibid., xxiii, p. 47], and distinguishable from that due to *D. lycopersici* by the folding of the tissues of the outside of the stem, the firmness of the epidermis, and the absence of pycnidia.

Studies by I. W. Selman showed that when Potentate tomato plants at the 8- to 9-leaf stage were planted in pots containing a mixture of stable manure 2 parts, compost 2 parts, and maiden loam 1 part or a mixture of peat 2 parts and loam 3 parts, all the pots receiving the same base fertilizer, and were inoculated a day later in all leaves with the spotted wilt virus, no two plants in either series showed

identical symptoms. In old plants, contamination with tomato mosaic virus was detected. In such cases, the symptoms chiefly resembled mosaic, while in the fruit, ripening appeared to lead to the inactivation of the spotted wilt virus.

In an experiment by Selman made to determine to what extent soil conditions may modify the incidence of blotchy ripening in association with mosaic, it was found that the addition of peat to the soil increased the percentage of blotchy ripening, the increase being highly significant in the mosaic-infected plants and greater in these than in the uninoculated controls. Where mosaic is likely to be widespread, the incorporation of large quantities of peat into the soil may prove highly detrimental to fruit quality. Steaming the soil increased the proportion of blotchy fruit both in the control and, though to a less extent, in the mosaic plants. Compost — stable manure gave the heaviest fruit yields from both the control and the mosaic plants. When a solution of minor elements was watered on to the soil, the amount of blotchy fruit was reduced in the mosaic plants.

It is concluded that one factor influencing blotchy ripening of tomatoes is the type of growth associated with the water-retaining properties of a particular soil mixture. This factor appears to be most favourable for quality fruit production with a soil-stable manure mixture for pot work.

Seventeenth Annual Report of the Commonwealth Council for Scientific and Industrial Research for the year ended 30th June, 1943.—76 pp., 1944.

This report from Australia [cf. *R.A.M.*, xxii, p. 468] contains, *inter alia*, the following items of interest. The unsatisfactory growth of lucerne and subterranean clover [*Trifolium subterraneum*], widespread on the southern tablelands, is now regarded as due to lime deficiency. In a pot experiment with lucerne, the equivalent of one ton of lime per acre increased the yields upwards of three times, and a response to phosphate resulted only in the presence of lime; response to molybdenum was obtained in the absence, but not in the presence, of lime [see below, p. 105].

In a three-years' test in a field naturally infected with take-all (*Ophiobolus graminis*), continuous cropping with wheat gave 75 per cent. take-all with a very low yield of grain. Bare fallow for two years completely controlled infection and gave the highest yield of all treatments (38 bush. per acre). A wheat-fallow-wheat rotation gave 14 per cent. take-all with 30 bush. per acre. Oats-fallow-wheat gave 3 per cent. take-all and 30 bush. per acre. Wheat after two years' lucerne gave a poor yield, with 13 per cent. take-all. Wheat after two years' Wimmera rye gave an equally poor yield, but with only 3 per cent. take-all. In the wheat-oats-wheat rotation take-all amounted to 10 per cent. and the yield to 25 bush. per acre. Roots from the block fallowed for two years showed no lesions; the severest root injury was in the block continuously cropped to wheat.

The out-of-doors experiments with drums of soil [ibid., xxii, p. 295] were continued, and significant differences were obtained in the numbers of white-headed plants between the drums inoculated with *O. graminis* in 1941 and those not inoculated, the number of whiteheads being greater in the latter. This unexpected response was due chiefly to greater depletion of plant food by the more vigorous growth of the plants in the uninoculated drums during the previous year. Plants growing in soil with adequate amounts of plant food do not readily suffer from take-all. In the current season's experiments very significant differences in severity of root-rotting were noted, and as with whiteheads, the worst occurred in the drums in which a good crop was obtained in the previous year. By adding large amounts of calcium sulphate or burnt lime to the soil root rotting was almost completely eliminated.

The control of internal cork of apples by soil dressings of $\frac{1}{2}$ lb. borax per tree has continued for the seventh year since the application was made. This disorder

is now almost non-existent in Tasmania. Cork of pears and dimple of Granny Smith and Cleopatra apples [ibid., xxi, p. 406] failed to respond to chemical treatments.

Trials of the susceptibility of citrus rootstocks to *Phytophthora citrophthora* [ibid., xxii, p. 133] showed that all lemon and sweet orange types were very susceptible; Seville types were fairly so, and *Poncirus trifoliata* virtually resistant. *P. trifoliata*, especially when budded to Navel oranges, is very inconsistent in its behaviour. Very often the trees are dwarfed in this stock. Selection of *P. trifoliata* types which produce vigorous growth in the scion variety is in progress.

Except for rust [*Melampsora lini*], which caused more than usual loss in Tasmania, the main diseases of flax appear to be physiological in origin. Die-back is associated with waterlogging near flowering time, while browning, which is associated with *Pullularia pullulans* [ibid., xxi, p. 370], is of importance only on some peaty soils. *P. pullulans* can be isolated with equal facility from healthy harvested straws kept moist for about 24 hours. It is one of the commonest retting organisms.

In the development of potato varieties resistant to viruses A, X, Y, and leaf roll, the most promising results have been secured in obtaining crossbred seedlings resistant to Y. Stocks of Up-to-Date potatoes free from virus X resisted drought conditions better than certified stocks of this variety containing virus X.

Much basic work was done in devising sampling methods for estimating and studying the total populations of the aphid vectors of virus diseases in potato crops [ibid., xxiii, p. 273]. This involved measurements of the leaf area of entire plots [ibid., xxiii, p. 73]. A workable rating method was established which gives results accurate to a few per cent. The differences in leaf area of different strains and varieties largely depend on the growth rates of the axillary shoots; in early-maturing types axillary growth is slow and soon stops [ibid., xxiii, p. 496]. The new methods are being applied to such problems as the relative importance of winged and wingless aphids in the transmission of leaf roll in the field. Evidence so far obtained suggests that differences in susceptibility to leaf roll in the commoner Australian potato varieties are a function of the plant tissues and not merely due to preferential feeding by aphids.

It was ascertained that different lots of the same potato variety carried strain mixtures of virus X of the same average severity. Some varieties carried more severe strains than others. Varietal susceptibility appears to determine to a great extent the proportion of strains in the mixtures of virus X normally present in plants and tubers. This has a bearing on the selection and maintenance of seed stocks containing mixtures of virus X consisting predominantly of mild strains and therefore potentially capable of higher yields than ordinary stocks.

The tomato spotted wilt virus was found to be normally a complex of at least three strains, mild, ring spot, and necrotic. The necrotic appears to be identical with the American tip-blight virus [ibid., xxiii, p. 289]. Different combinations of the strains cause widely varying symptoms.

Preliminary work indicated that a very large number of strains of suitable fungi will have to be tested before a strain can be found that will produce a high yield of citric acid. Production from wheat grain was demonstrated by two fermentation processes, saccharification of steamed grain with *Mucor racemosus* followed by acidification with weak sulphuric acid and fermentation with *Aspergillus niger* [cf. ibid., xxiv, p. 67].

Granny Smith apples hand-dipped in an alcoholic solution of 8 per cent. castor oil and 2 per cent. de-waxed shellac (at a cost of about fourpence per case) remained green for five months in the packing-shed [cf. ibid., xxiii, p. 303]. The treatment greatly reduced the incidence of Jonathan spot, lenticel and late scald, breakdown, and bitter pit. The effect of the coatings largely depends on the maturity reached

at picking. Immature treated fruit may develop alcoholic flavours, and over-mature fruit may develop skin disorders; the latter are also more susceptible to mould and calyx rot than the former.

WALLACE (G. B.). **Plant Pathology.**—*ex* Specialist and research work of Department of Agriculture, Tanganyika Territory, 1943, pp. 24-27, [1944]. [Mimeographed.]

In this report [cf. *R.A.M.*, xxiv, p. 8] it is stated that *Sclerotinia sclerotiorum* was observed on French beans for the first time in the Arusha district of Tanganyika Territory in 1942; in 1943 the disease made no appearance, and the previously affected area was planted with maize. In the same year, however, the fungus caused considerable damage to French beans at Oldeani and in the Moshi district.

Alternaria porri was severe on onions and leeks in some localities, while *Puccinia allii* again caused losses to onions and garlic in the Nbubu district. Other new records of vegetable diseases are listed [ibid., xxiii, p. 501].

Cotton leaf spots were conspicuous at Lubaga, accompanied by leaf fall, bud-shedding, and premature splitting of the bolls in cotton strain trials. All strains were affected, particularly 0 53. An *Alternaria* of the *macrospora* group was associated with the disease.

No reports of excessive injury to wheat by *P. graminis* were received. Leaf rust (*P. triticea*) was present everywhere, though without causing much damage, and *Bacterium* [*Xanthomonas*] *translucens* var. *undulosum* was reported as severe on Kenya Governor wheat in the Arusha district. In one locality near Arusha maize infection by *P. maydis* caused a serious set-back and reduction of yield.

Apple pink disease (*Corticium salmonicolor*) was associated with branch die-back. Yellowing of grapefruit leaves responded to zinc sulphate treatment.

WATERS (H. B.). **Report on the Department of Agriculture, Gold Coast, for the year 1943-44.**—10 pp., 1944.

In this report [cf. *R.A.M.*, xxiii, p. 6] it is stated that cacao swollen shoot [ibid., xxiii, p. 254] has continued to spread in the area of the Gold Coast that is chiefly affected, viz., Koforidua, Tafo, Suhum, and Mangoase, and is likely to do so in other parts, including Peki, Wiawso, Nkawaw, and Konongo. In April and May, 1943, in Kwahu 13,475 trees were cut out, and the compensation paid for apparently healthy contacts removed was £155. 5s. 1d. In the Kwabeng (South) area the figures were 306 trees and £12. 11s. 8d. Treatment ceased in May, 1943. A recent survey of the treated patches of the Kwabeng area failed to reveal any fresh attacks round the perimeters.

As a result of a visit by Dr. H. A. Tempany, and after consultation with the Governor and Resident Minister, a comprehensive cacao research scheme on a West African basis was planned with headquarters at Tafo.

NATTRAß (R. M.). **Disinfection of cereal seed.**—*E. Afr. agric. J.*, x, 2, pp. 72-74, 1 fig., 1944.

The author gives a brief popular account of cereal seed disinfection against fungal diseases, and concludes with directions for making an oil-drum mixer.

YABLOKOVA (Мме V. A.). Применение прижизненной и флюоресцентной микроскопии для обнаружения мицелия пыльной головки в пропеготом и непропеготом зерне Пшеницы. Сообщение 3-е. [The application of fluorescent microscopy for the detection of live mycelium of *Ustilago tritici* in the heated and non-heated Wheat grain. Third communication.]—*J. bot. U.S.S.R.*, xxix, 2-3, pp. 72-79, 3 figs., 1944. [English summary.]

Of the various methods tested by the author in a study of the effect of moist heat

treatment on the mycelium of *Ustilago tritici* [*R.A.M.*, xxii, p. 425] in wheat seed-grain, different types of staining were found to afford no possibilities of differentiating the cells of the mycelium from those of the host. On the other hand, results obtained by fluorescent-microscopic analysis, involving the examination of sections of infected grains in ultra violet light, showed that the parasite can be distinguished from the host by the brighter and differently coloured fluorescence of the fungus. It was found that the fluorescence of the fungus localized within the germinating wheat grain which had received moist heat treatment was somewhat less bright than that in the untreated grain and duller still, with a change in colour, in grains treated at temperatures slightly higher than the usual (up to 55° C.). The action of the moist heat treatment apparently consisted in weakening rather than killing the mycelium in the grain. Although such damaged mycelium may, under favourable conditions, continue to develop together with the plant tissue for some time, eventually it begins to lag behind and finally perishes altogether.

WINTER (A. G.). **Der Einfluss partieller Sterilisation des Bodens auf die Entwicklung der Laufhyphen von *Ophiobolus graminis*.** [The influence of partial soil sterilization on the development of the 'runner' hyphae of *Ophiobolus graminis*.] - *Phytopath. Z.*, xiv, 3, pp. 204-302, 9 graphs, 1942. [Received November, 1944.]

Further studies at the Bonn Phytopathological Institute on the influence of partial soil sterilization on the development of 'runner' hyphae in *Ophiobolus graminis* [*R.A.M.*, xxi, p. 11] showed that this process is stimulated by treatment of the soil with heat (50° to 100° C.), chloroform, sulphur dioxide, alcohol, or toluol. No direct connexion could be established between the nutrient content of the soil and the production of 'runners', which derive their food supply from the roots of the host. 'Runner' development may, however, be indirectly affected by the admixture with the soil of organic materials, such as maize meal, glucose, or cut or crushed portions of flowering broad beans, in so far as these modify the natural microflora in a manner favourable or adverse to the requirements of the pathogen.

The incapacity of the fungus to lead a purely saprophytic existence in field soils cannot be attributed to nutrient deficiency, and the promotion of 'runner' growth in partially sterilized soils appears to be due to the elimination of inhibitory factors. The latter can be restored to treated soils by inoculation with small quantities of unsterilized soil containing the antagonistic micro-organisms. It is as yet uncertain whether the destruction of the inhibitory properties is an immediate consequence of partial soil sterilization or follows upon a secondary process of biotic or chemical (? oxidative) disinfection; the latter is believed at any rate to exert an important influence, if not a decisive one.

The 'runner' hyphae react to partial sterilization at a temperature range from 50° to 134° by a growth curve reaching a peak at 70° on loess loam and at 90° to 98° on compost. At relatively high temperatures the combined use of (1) carbon disulphide and (2) heat for partial sterilization is little more beneficial to the 'runners' than heat alone, but at a lower range the two treatments together are more effective than either alone. Where heat precedes carbon disulphide in combination treatments the development of the 'runners' is much poorer than when either method is applied alone.

In general, the two very divergent soil types used in the experiments responded similarly to partial soil sterilization, but their normal inhibitory effects on *O. graminis* evidently rest on their colonization by quite different sets of antagonistic micro-organisms. Thus, it was found impossible to restore the inhibitory properties of compost by an admixture of loess, whereas inoculation with heath humus, which is poor in competitors with *O. graminis*, conferred on the treated compost the

same activity against the fungus as is exercised by unsterilized soil of comparable character. Many complications thus appear likely to attend the biological control of foot rot by means of soil inoculation with antagonistic microflora producing inhibitory substances in other soil types. More hopeful than the introduction of particular micro-organisms into soils poorly equipped with defensive properties is an indirect method of approach, involving the modification of environmental conditions in favour of the antagonists by the addition of organic materials, the fermentative decomposition of which aids the production of substances detrimental to *O. graminis* by the existing microflora. In the field the development of 'runners' may be impeded by an unfavourable hydrogen-ion concentration or defective soil aeration, but such factors are usually subordinate to the inhibitory activities of rival micro-organisms.

GARRETT (S. D.). **Soil conditions and the take-all disease of Wheat. VIII. Further experiments on the survival of *Ophiobolus graminis* in infected Wheat stubble.**—*Ann. appl. Biol.*, xxxi, 3, pp. 186-191, 1 pl., 1944.

In further experiments on the longevity of *Ophiobolus graminis* [*R.A.M.*, xxi, p. 133] assimilable nitrogen, added to tumblers containing artificially infected wheat straw and either soil or sand, was found to prolong the life of the fungus, especially when used in the form of calcium nitrate. The optimum rate of application for promoting the survival of the fungus on wheat straws in soil was 0.45 gm. nitrogen (per 100 gm. air-dry straw); and in washed quartz sand 0.5 gm. At these rates the percentage of straws containing viable *O. graminis* mycelium was 79 after 28 and 60 after 24 weeks, as against 24 and 13, respectively, in the corresponding control series receiving no nitrogen. Addition of sodium phosphate failed to exert any significant effect on the longevity of the organism. It is suggested that nitrogen prolongs the life of *O. graminis* by enabling it to form new branch hyphae which can explore unexhausted parts of the substratum, while in the absence of available nitrogen the fungus may die of carbohydrate starvation when it has exhausted the zones of enzymic erosion around the hyphae. Support for this hypothesis was gained in a test in which the decline of the fungus was retarded, even if only for a limited period, when infected straws were shaken with some garden soil twice weekly in 3 per cent. dextrose solution. Particulars of technique and detailed results are given of an experiment previously described [*ibid.*, xxiii, p. 59], which indicated that crop plants may be used to compete with *O. graminis* for available nitrogen in the soil.

The results of two small experiments with naturally infected wheat stubble buried in quartz sand confirmed those obtained with the artificially infected straws: examined after three months or eight weeks the percentage of stubble containing viable mycelium of *O. graminis* was 2.2 and 38 in the series receiving 0.5 gm. nitrogen, as against 8 and 15 in the corresponding controls receiving no addition.

MUSKETT (A. E.). **The short wet method of seed disinfection.**—*Ann. appl. Biol.*, xxxi, 3, pp. 218-221, 1 pl., 1944.

When large quantities of cereal seed are sown by hand the use of a seed disinfectant dust, whether poisonous or not, may prove unpleasant, and the author therefore investigated the possibility of using the short wet method of seed disinfection against *Helminthosporium* disease of oats (*H. avenae*) [*R.A.M.*, xvii, p. 809]. The quantity of liquid used was so small that the seed dried out readily after re-sacking without suffering any deleterious effect. The thorough wetting of the seed was achieved by the inclusion of an effective wetting agent. In three small-scale experiments conducted during 1935-37, the short wet method (3.5 per cent. solution of ceresan U. 564, 0.45 gal. per cwt. (40 c.c. per kg.) seed) was proved

to be as effective as dusting with ceresan U.T. 1875A (2 oz. per bush.); Sch. 3330, another soluble organic mercury compound also gave promising results. In large-scale experiments, a small hand-operated machine, the Primus [ibid., x, pp. 374, 445, 650], and a power-driven, the Kontramix [ibid., xx, p. 535], both manufactured in Germany, were used for carrying out the short wet method. The former is capable of dealing with some 38 kg. of seed oats at a time and is of the revolving drum type, the liquid disinfectant being fed into the drum through perforations in an axle; the latter is designed for the continuous treatment and consists of a rotating cylinder feeding the seed at an even and controlled rate into the disinfection chamber into which the disinfectant is atomized in the form of a fine mist. Both machines proved suitable for the short wet method and gave results which compare favourably with those from any other method; the cost of the short wet treatment is also lower than that of the dry. It is recommended that seed disinfected by the short wet method should be sown within three months of its treatment.

SEMIENIUK (G.). **Seedling infection of dent Maize by *Sclerotium bataticola*.**—*Phytopathology*, xxxiv, 9, pp. 838–843, 1 fig., 1944.

Charcoal rot of dent maize (*Sclerotium bataticola*) [*Macrophomina phaseoli*], first observed in Iowa in August, 1941 [*R.A.M.*, xxii, p. 384], was again detected in September, 1943, on some 33 per cent. of the plants in parts of several fields covering a limited area. Its parasitism to maize seedlings, not previously recorded, was established in greenhouse inoculation experiments which resulted in severe mesocotyl and primary root necrosis, accompanied by stunting, though the disease developed only in seedlings raised in soil steamed for five hours at 15 lb. pressure, competition with other micro-organisms, e.g., *Fusarium moniliforme* [*Gibberella zeae*], being reduced to a minimum. The disease assumed a more serious character at 25° to 30° C. than at lower temperatures. The four inbred lines and two single crosses used in the tests varied to some extent in their reactions to the agent of charcoal rot.

YOUNG (P. A.). **Epidemic of charcoal rot of Corn and other crops in east Texas.**—*Plant Dis. Repr.*, xxviii, 29, pp. 898–899, 1944. [Mimeographed.]

The following factors contributed to an epidemic of maize charcoal rot (*Macrophomina phaseoli*) which appreciably reduced the yield of the 1944 crop in east Texas [*R.A.M.*, xxiii, p. 187]: (1) abnormally heavy spring rains packed the soil round the seedlings and delayed growth for a fortnight or up to a month; (2) through the same agency much of the commercial fertilizer applied to the infertile red and sandy soils was leached out; (3) the hot, dry spell from June to August weakened the plants and enhanced their susceptibility to the parasite, which thrives under such conditions. *M. phaseoli* predominates in the lower 18 in. of the stalks, where the epidermis turns grey and often looks black owing to the numerous sclerotia showing through it from the white pith within. Shredding and consequent partial hollowness of the stem bases, followed by lodging of the stalks, are features of the later stages of the disease. Other plants attacked by the pathogen at the Agricultural Experimental Station were tomato, potato, Pinto bean, velvet bean [*Stizolobium deeringianum*], cowpeas, Hubam sweet clover [*Melilotus*], Ogden soy-bean, watermelon, cantaloupe, sorghum, sweet corn, *Crotalaria spectabilis*, and *Cosmos sulphureus*, the beans, cowpeas, sweet clover, and sweet corn being particularly susceptible and showing the above-mentioned grey epidermal discoloration, while cowpea stems harboured the pycnidia of the fungus and sclerotia were detected in the stem bases of *C. sulphureus*, *Crotalaria spectabilis*, tomato, and soy-bean.

BATCHELOR (L. D.) & ROUNDS (M. B.). **Effect of root-stocks on Lemon decline and yield in two experimental orchards.**—*Calif. Citrogr.*, xxix, 9, pp. 242-243, 265-269, 2 figs., 1 graph, 1944.

The symptoms of lemon tree decline disease in California [*R.A.M.*, xxiii, p. 483] are given as follows. At some time during the second decade of the growth of an orchard certain trees may show a tendency to shed their leaves prematurely, those left on the trees turning a yellowish bronze colour, but not necessarily mottled or chlorotic. The small lateral twigs die prematurely and new twig growth does not develop normally; this results in a reduction in yield and in excessive numbers of small 'tree-ripe' fruits. A marked symptom is the dying-back of tree tops which, supplemented by pruning, reduces the top volume of affected trees progressively. The disease symptoms do not usually occur uniformly throughout the orchard and during some seasons certain trees or even whole orchards may show marked improvement, although a relapse may be expected to occur later. It is pointed out that the name 'lemon tree decline', hitherto used rather loosely, may be more properly applied to certain general clinical symptoms than to a specific condition due solely to one cause.

The results of root-stock experiments with the Eureka and Lisbon varieties of lemon, propagated in each case from one single parent tree, confirmed the observations of many other workers that the root-stock is at least one very important factor in lemon tree decline. The disease is apparently specific for lemons. Data collected during at least five annual surveys of the two experimental orchards planted in 1927, one near Riverside and another on the Rancho Sespe, showed that, in the latter, the gradual though somewhat fluctuating increase in the average decline observed from 1938 to 1941 reached its height in May, 1941, following a year of heavy rainfall, when the picking of the fruit was delayed for several weeks after maturity. This delay in harvesting is believed to be responsible for the extremely bad condition of the orchard. The fluctuation in the intensity of the disease from year to year was even more marked in individual trees. Trees on sweet orange root-stocks were strikingly less subject to decline than those on sour orange or rough lemon, those on mandarin orange and grapefruit stocks occupying an intermediate position, with mandarin the more desirable of the two. Trees on Sampson tangelo stocks were even more resistant to decline than those on sweet orange, possibly owing to the fact that the fibre roots of the tangelo [tangerine \times pomelo] are more resistant to injury by nitrite and also by *Phytophthora* spp. than are those of other root-stock species. Similar data were collected at Riverside, except that the rough lemon proved much less prone to decline on light soil here than on the clay loam at Sespe, and the Lisbon variety showed somewhat more decline than the Eureka. Strains of the Lisbon lemons are believed to be susceptible to decline in the following descending order: open-type, semi-dense, and short-thorn Lisbon (sometimes erroneously called Villafranca). The yield data showed that in both orchards the best results were obtained with Sampson tangelo, which is apparently equally well adapted to both light and silt loam soils and is considered worthy of trials on a commercial scale.

BARTHOLOMEW (E. T.) & SINCLAIR (W. B.). **Granulation and juice quality in Valencias was affected by insecticides.**—*Calif. Citrogr.*, xxx, 1, pp. 4-5, 1944.

Studies on the effect of oil sprays on granulation in Valencia oranges were carried out from 1939 to 1944 in two groves at the California Citrus Experiment Station, one at Ford-Craig, and the other at Griset. Two plots were fumigated (with hydrocyanic acid at from 18 to 23 c.c. per dose) and the other two sprayed with oil ($1\frac{1}{2}$ to $1\frac{3}{4}$ per cent. concentration). After two or three years, the treatments given were reversed, the plots that had been fumigated being sprayed, and vice versa. In the Ford-Craig grove the results showed in 1940 and 1941 an appreciably

higher percentage of granulated fruits on the sprayed than on the fumigated trees, while the soluble constituents were much lower in the former than in the latter. In 1942 and 1943, after reversal of the treatments, the relative amounts of granulation and juice constituents also became reversed.

In the Griset grove, during the first three years, granulation was much more prevalent and the soluble constituents noticeably lower in the oil-sprayed than in the fumigated plot. Reversal of treatments, however, appeared to have little effect, the relative amounts of granulation and quantities of juice constituents being about the same for each plot in 1942 and 1943, and a possible residual effect of the oil spray must be considered.

As a result of the work the conclusion is reached that the oil spray appeared to increase the amount and severity of granulation regardless of the size of the fruit. Other work by the writers (*J. econ. Ent.*, xxxiv, pp. 821-829, 1941) also demonstrated that oil sprays decreased the soluble constituents of the juice of Valencia and Navel oranges over the figures for fumigated or untreated plots. Hydrocyanic acid appeared to have no effect.

FAWCETT (H. S.). Psorosis and related virus disorders on Citrus.—*Calif. Citrogr.*, xxx, 1, pp. 14-15, 1944.

After distinguishing between the types of citrus psorosis known as psorosis A and B, concave gum disease, blind pocket, crinkly leaf, and infectious variegation [*R.A.M.*, xxiii, p. 61], the author points out that prevention depends on taking buds from healthy trees and budding them on to the healthy seedlings [*ibid.*, xxiii, p. 385]. Treatment of trees showing bark symptoms of psorosis A is recommended only for the early stages, before the foliage has deteriorated, and when not too many lesions are present; scraping away the outer bark over and round the lesions may then prolong the usefulness of the tree for 5 to 15 years. No disinfectant need be applied in dry weather. In wet weather, potassium permanganate (1 oz. per pt. water) may be brushed on to the treated areas to prevent entry of fungi. No practical treatment is known for the other forms of psorosis.

BERTELLI (J. C. DE) & BERTELLI (LUCIA K. DE). Notas fitopatológicas. Podredumbre de los raicillas de los Citros. [Phytopathological notes. Citrus rootlet rot.]—*Rev. Asoc. Ing. agron.*, xvi, 3, pp. 26-43, 26 figs., 1944. [English summary.]

The form of citrus root rot known as 'tristeza' [*R.A.M.*, xxiii, p. 484] was first observed in Salto, Uruguay, in 1940, reaching Rivera and Montevideo in 1943. In the course of their etiological studies on the disease, the authors found no evidence to support either of the two causes to which it has been attributed, i.e. incompatibility between stock and scion or the absence of certain minor elements from the soil. The nematode *Tylenchus semipenetrans* was found to be capable of inducing symptoms closely resembling those of 'tristeza', but in the former case the diseased trees responded to appropriate manurial treatment by permanent recovery, whereas in the latter they were only temporarily benefited. A species of *Lasiodiplodia* or *Botryodiplodia*, characterized by black, ostiolate pycnidia and chestnut-coloured, oval conidia, 22 to 26 by 12 to 14 μ , sometimes furnished with one septum and borne on hyaline, paraphysate conidiophores, was isolated on 2 per cent. potato dextrose and maize agar from the xylem of five trees (three orange and two mandarin on bitter orange stocks) with sunken zones below the point of union between scion and stock. Further experiments are planned to determine the possible connexion of this fungus with the development of root rot, and also to test the theory of its origin in virus infection.

FORBES (A. P. S.). A common Citrus disease in Nyasaland.—*Nyasald agric. quart. J.*, iv, 4, pp. 6-8, 1944.

In most parts of Nyasaland, citrus is affected by mottle leaf. Chlorotic leaves

generally occur on the side of the tree exposed to the greatest intensity of light. In mild forms of the condition the yield is reduced, and in severe ones almost negligible, the few fruits that are formed being small and hard. Spraying with a mixture of 10 lb. zinc sulphate (89 per cent. pure) and 5 lb. finely ground hydrated lime per 100 gals. water gave good results in experiments and is recommended, applications being made every two months until the chlorosis has disappeared.

VENKATARAYAN (S. V.). **Spraying of crops against fungoid diseases in Mysore.**—*Mysore agric. J.*, xxi, 4, pp. 123–126, 2 figs., 1943.

The protection of areca palms against koleroga [*Corticium koleroga*: *R.A.M.*, xviii, p. 451] is effected in Mysore by means of two applications of 5–5–25 Bordeaux mixture plus a spreader, such as resin paste or potash-resin soap, at the rate of 2 lb. per 25 gals., one before the rains of the south-west monsoon, towards the end of May or early in June, and the second six weeks to two months later. Other preventive measures should include thorough sanitation of the affected gardens, involving the collection and burning or deep burial of diseased plant refuse; destruction of the various weeds likely to serve as carriers of the pathogen, e.g., *Colocasia antiquorum*, *Bryophyllum calycinum*, *Jatropha curcas*, *Loranthus longiflorus*, and *Ficus hispida*; careful periodical inspections of certain useful trees, *Artocarpus integrifolia* and sandalwood, for instance, which also harbour the koleroga fungus; and the cutting-off and burning of the upper parts of dead areca and coco-nut palms.

PINCKARD (J. A.) & LEONARD (O. A.). **Influence of certain soil amendments on the yield of Cotton affected by the Fusarium-Heterodera complex.**—*J. Amer. Soc. Agron.*, xxxvi, 10, pp. 829–843, 5 figs., 1944.

Neither the total amount of infection nor the distribution of *Fusarium vasinfectum* and *Heterodera marioni* in Ruston and Sarpy sandy loams in Mississippi was influenced by any of the fertilizers [cf. *R.A.M.*, xxiii, p. 225] used in a series of trials covering a period of eight years on the former and three on the latter soil, but the average annual yields were greatly increased and the extent of the injury reduced by most of the amendments, notably stable manure at the rate of 4 tons per acre and upwards and rotted lucerne hay buried in the furrows. It is suggested that unfavourable conditions for cotton root development in the field predispose the plants to infection by *F. vasinfectum*, the incidence of which might be decreased by improvements in the culture of winter legumes and ploughing down the tops, thereby throwing the bulk of the vegetation under the future cotton rows.

RUDOLPH (B. A.) & HARRISON (G. J.). **The unimportance of Cotton seed in the dissemination of Verticillium wilt in California.**—*Phytopathology*, xxxiv, 10, pp. 849–860, 1 fig., 1944.

Cultural studies covering the five-year period from 1934 to the end of 1938 on 3,371 cotton bolls produced on Acala plants severely infected by wilt (*Verticillium albo-atrum*) in California [*R.A.M.*, xi, p. 513; xix, p. 14] showed that the pathogen had reached only 150 receptacles (4.44 per cent.) and penetrated not farther than the bases of the placental columns of two bolls (0.00059 per cent. of the possible seed). None of the 763 seeds from 28 bolls yielded the fungus, which likewise failed to develop from non-sterilized, lint-bearing seed taken from the bottom of the pickers' bags to ascertain the possibility of contamination from infective material as the sacks are dragged along the ground. In another series of tests from 1937 to 1942, 11,723 cultures were made from the minute, black, superficial or erumpent bodies on dead cotton stalks to determine their possible identity with the microsclerotia of *V. albo-atrum*, again with negative results. The organism was shown to die out fairly

rapidly once the tops of the plants have been killed by frost, but it persists in a viable state until the following spring in many of the undecayed tap-roots as well as in the heavier woody portions of the stem at soil-level. Finally, to test a theory that the lint contracts infection at the gins, cotton removed from bolls and steam-sterilized in culture tubes was inoculated with fragments of micro-sclerotial crusts of the fungus from Czapek's agar (which was used throughout the investigation). The cotton proved to be a poor medium, the growth of *V. albo-atrum* being supported only by lint wet virtually to saturation point, a condition highly unlikely to occur at the gins.

The experimental evidence here presented is considered to demonstrate the extreme improbability of the dissemination of cotton wilt by way of the seed from diseased plants, as well as of the infection or contamination of the lint on healthy seed.

ARNDT (C. H.). **Infection of Cotton seedlings by *Colletotrichum gossypii* as affected by temperature.**—*Phytopathology*, xxxiv, 10, pp. 861-869, 3 graphs. 1944.

At the South Carolina Agricultural Experiment Station, four lots of 1938 cotton seed (A. Mexican Big Bolt from North Carolina. B. Dixie Triumph from South Carolina, and C. and D. Stoneville 2b from Mississippi and Georgia) infested by *Colletotrichum* [*Glomerella*] *gossypii* and *Fusarium moniliforme* [*Gibberella fujikuroi*] were germinated at 18°, 22°, 25°, 29°, 33°, and 36° C. Anthracnose lesions developed earliest (on the fifth day) at 29° and 33°; the percentages of seedlings outgrowing the symptoms at these two temperatures were 10 and 40, respectively, while at 22° and 25° the disease attained its maximum severity, killing nearly all the infected plants before the 14th day, and the percentage of survivors was under 10 [*R.A.M.*, v, p. 90]. There was little infection by *Glomerella gossypii* at 18° and none at 36°. From 4 to 6 per cent. of the cotyledons were destroyed by a species of *Rhizopus* at 33° and 36°.

The differences among the four lots of seed in respect of mortality percentages were somewhat greater at 22° (5, 10, 12, and 0 for A, B, C. and D, respectively) than at 25° (40, 25, 25, and 0, respectively), the figures at the former temperature indicating the response of the several lots to seed treatment with ethyl mercury phosphate in field plantings.

UPPAL (B. N.), CAPOOR (S. P.), & RAYCHAUDHURI (S. P.). **'Small-leaf' disease of Cotton.**—*Curr. Sci.*, xiii, 11, pp. 284-285, 2 figs., 1944.

'Small leaf' or stenosis of cotton is prevalent in the Provinces of Bombay, Madras, and the Punjab [*R.A.M.*, xv, p. 648], and experiments were carried out at Anand, North Gujerat, and at Poona, to determine the possibility of its transmission by grafting. Rozi (*Gossypium arboreum* var. *typicum* f. *indica*), a highly susceptible perennial variety widely cultivated in the Kaira district of Bombay, was used as the stock, the top being cut off and the stem split down the middle for about an inch to permit the insertion of scions from diseased plants. Some of the tests were successful [number unspecified], as indicated by the typical symptoms of stenosis in the new growth arising from the axillary buds on the previously healthy stocks. Other experiments on American, Jarilla, Gaorani, and Mungari stocks likewise gave positive results. These data are considered to establish the agent of the disease as a graft-transmissible virus, which is apparently not communicable through the sap or seed.

LING (L.). **Factors influencing the development of Cotton diseases.**—*Ann. appl. Biol.*, xxxi, 3, pp. 194-204, 6 graphs, 1944.

Cotton, mainly *Gossypium arboreum* and occasionally *G. hirsutum*, grown in the northern part of the Szechwan Province, China, is stated to suffer most commonly from bacterial blight (*Bacterium* [*Xanthomonas*] *malvacearum*), anthracnose (*Glome-*

rella gossypii), sore shin (*Rhizoctonia* [*Corticium*] *solani*), alternariose (*Alternaria macrospora* and *A. tenuis*) [*R.A.M.*, xx, p. 573], areolate mildew (*Mycosphaerella areola*), and boll rots (*Fusarium moniliforme* [*Gibberella fujikuroi*], *Diplodia gossypina*, and others). Extensive surveys were made during 1938-41 at ten-day intervals throughout the growing season in Suinin to investigate the relation of these diseases to climatic factors. A study of meteorological data (presented in averages or totals of periods of ten days to facilitate comparison between different years) revealed that under local conditions air humidity was more variable between the years than was air temperature or rainfall, and also that it had the greatest influence of the three on the development of nearly all the diseases except the soil-borne sore shin, which is more profoundly influenced by soil moisture and soil temperature. Generally, air humidity, when temperature was not extreme, determined to a large extent the reproduction and longevity of the inoculum, the initiation and intensity of infection, and the survival of the organism, temperature being apparently a subservient factor.

In 1938, relative humidity was low in May but became higher than in all other years from June to the time of picking; accordingly the seedling diseases were unimportant, while diseases of mature plants, including the boll rots, were serious. In 1939, high humidity early in the season encouraged the development of seedling diseases, while most diseases were greatly checked by low humidity later in the season. In the boll stage a very dry condition almost entirely eliminated the boll rots. During this and the preceding, but not the following, two years leaf infection of anthracnose was especially prevalent as a result of high humidity in June, doing little harm to upland cotton but seriously damaging the Asiatic varieties by causing premature falling of leaves and even death of whole plants. In 1940, the humidity in May was the highest of the four years under review, and accordingly seedlings suffered from heavy anthracnose infection. Bacterial blight, on the other hand, was almost negligible. As both diseases are known to be carried over the winter mainly by seed and had been very scarce on cotton bolls in the previous year, it is concluded that the abundance of anthracnose on seedlings points to another mode of survival, probably as a saprophyte. *Alternaria* leaf spot was also highly destructive on seedlings. Unusually dry weather in July, 1940, checked the development of leaf and stem diseases such as bacterial blight, *Alternaria* leaf spot, and anthracnose, but a gradual increase in humidity in late August and September brought about a high incidence of bacterial blight and a severe outbreak of boll rots. In 1941, the humidity was low before the middle of July but rose later, resulting in a gradual increase of bacterial blight late in the season and an outbreak of various boll rots, *Alternaria* leaf spot also appearing later than usually. Sore shin was generally greatly reduced by prolonged dry periods before and after sowing, as in 1938 and 1941. Ordinarily, the disease appeared in May soon after the emergence of seedlings and was checked by the rise of temperature later in the season. In 1940, however, the unusually low soil temperature in May permitted the occurrence of a high percentage of infection as late as early June.

Variation in the time of sowing was found to influence the incidence of diseases of both seedlings and mature cotton plants. In the latter, late sowing appeared to reduce the intensity of bacterial blight and anthracnose. Of the cultural practices tested, nitrogenous fertilizers generally increased the incidence of most diseases; denser stand and closer spacing brought about a heavier infection in stem and leaf but not in boll diseases; and a mixed cropping system had no effect on the fungal and bacterial diseases.

BEARD (R. L.). **Susceptibility of Japanese Beetle larvae to *Bacillus popilliae*.**—*J. econ. Ent.*, xxxvii, 5, pp. 702-708, 2 graphs, 1944.

Experimental evidence is adduced to show that the virulence of *Bacillus popilliae*

as an agent of milky disease among Japanese beetle [*Popillia japonica*] larvae [*R.A.M.*, xxii, p. 480] is far less than that of *B. larvae* in the production of foul-brood in honey bees.

MILLIKAN (C. R.). **Phoma stem disease of Flax.**—*J. Aust. Inst. agric. Sci.*, x, 3, pp. 129–130, 1 fig., 1944.

In December, 1942, a small percentage of plants in a mature crop of Concurrent flax growing at Leongatha, Victoria, developed severe stem-spotting somewhat resembling that of the 'pasma' disease (*Sphaerella linorum*). The spots, which were elongated and dark brown, often with a lighter centre, occurred on any part of the stem, and usually encircled it. In some plants, the upper half of the stem was dead, while in others a sharp bend occurred at the site of the lesion.

Affected areas showed the presence of the subepidermal, dark, spherical pycnidia of a species of *Phoma* measuring 96 to 130 μ in diameter, with a round ostiole measuring 17 to 21 (average 19) μ in diameter. The hyaline, unicellular, elliptical spores ranged from 2.1 to 17.3 by 0.9 to 6.9 (average 6.5 by 2.2) μ . The average measurements are close to those of *P. exigua* [*R.A.M.*, xviii, p. 316], but the range in size is greater. *P. linicola* has on the average larger pycnidia and spores. The species is not identified.

GRANHALL (I.). **Linrosten—en Spånadslinets fiende.** [Flax rust, an enemy of spinning Flax.].—*Lantmannen, Uppsala*, xxviii, 32, pp. 733, 735–736, 1 fig., 1944.

During the last few years severe outbreaks of flax rust (*Melampsora lini*) have been observed in south Halland, Sweden [*R.A.M.*, xviii, p. 679]. In 1944 no differences in varietal reaction to the pathogen were observed, contrary to the experience of previous seasons, when Concurrent suffered heavier damage than Herkules. Reports from Denmark, however, state that Concurrent is less susceptible in that country than the blue-flowered varieties. Precautionary measures against the disease should include the use of thoroughly cleansed seed; crop rotation and the selection of fresh sites at a distance from fields that were under flax the year before; stringent exclusion from the new fields of infected stubble from the preceding harvest; timely sowing and sparing applications of stable manure; and early lifting of a rusted crop to prevent the spread of the fungus.

LAFFERTY (H. A.) & MCKAY (R.). **'Pasma' disease on wild flax, *Linum angustifolium*.**—*Nature, Lond.*, cliv, 3918, p. 709, 1944.

During the summer of 1944, flax diseases were very severe in Ireland [Eire]. *Phoma* sp. [*R.A.M.*, xxiii, p. 17] and *Melampsora lini* [ibid., xxiii, pp. 334, 342] were widespread and virulent, the former being particularly troublesome on crops raised from home-saved seed. *Linum angustifolium* from a farm in one of the southern counties showed symptoms closely resembling those of 'pasma' disease and a fungus agreeing with the published descriptions of *Sphaerella linorum* [ibid., xxiii, pp. 17, 63] was isolated from the affected plants. Cross-inoculations on seedlings of *L. usitatissimum* showed that the fungus readily passed over to ordinary flax. While the disease has not yet been recorded on the last-named host in Ireland, it is probably present on this crop. *Colletotrichum linicola* [ibid., xxiii, p. 17] was also found on *L. angustifolium* and in this case also cross-inoculations showed that the fungus readily passed over to ordinary flax.

HAWKER (LILIAN E.). **Diseases of the Gladiolus. I. Control of hard rot, due to *Septoria gladioli* Passer., by fungicidal treatment of the corms.**—*Ann. appl. Biol.*, xxxi, 3, pp. 204–210, 1 fig., 1944.

In four years' experiments at the Imperial College of Science Field Station at

Slough, losses from hard rot of gladiolus (*Septoria gladioli*) [*R.A.M.*, xx, p. 468], measured by arbitrary methods of disease- and weight-indexing, were reduced by treating the dehusked corms before planting with various fungicides. Disease index values showed that of the mercury compounds tested, mercuric chloride, aretan, and ceresan were about equally effective, while calomel (mercurous chloride) was less so. In a number of small-scale experiments uspulun did not compare favourably with aretan and was omitted from large-scale trials. The non-mercury compound folosan usually gave less satisfactory results, but the difference was not significant in large-scale trials. The weight index data were in general agreement with these results but ceresan gave a low weight of clean corms produced per old corm planted while folosan gave the highest values. When corms with definite hard-rot lesions were treated, the effect of fungicides as measured by the disease index was much less marked, but the weight index showed improvement after treatment with mercuric chloride and aretan. The addition of hydrochloric acid or a preliminary dip in methylated spirits to facilitate wetting did not increase the efficiency of mercuric chloride (three hours' steep in a 0.1 per cent. solution), while the wetting compound, agral, was definitely harmful to the corms and usually lowered the effect of the fungicide. Reduction in time of steeping to one hour gave promising results. Treatment in November was somewhat more effective than in March. Corms treated with ceresan produced stunted foliage and poor flowers. No other treatment caused any loss of quality, but all the mercury compounds tended to delay flowering, particularly in the presence of agral.

HAWKER (LILIAN E.), BRAY (R. J.), & BURROWS (T. W.). **Diseases of the Gladiolus. II. Experiments on dry rot disease caused by *Sclerotinia gladioli* Drayt.**—*Ann. appl. Biol.*, xxxi, 3, pp. 211–218, 1 pl., 1944.

The results of inoculation experiments conducted in 1938 and 1939 showed that (1) young gladiolus corms are more susceptible to *Sclerotinia gladioli* [*R.A.M.*, xx, p. 20] than old ones and that they become less susceptible as the growing season advances; (2) unwounded corms are attacked almost as freely as wounded ones; and (3) inoculation of old corms at the top is more effective than at the base or side. The percentage of diseased new corms produced from infected parent corms varied from 0 to 100 according to soil conditions and was highest in wet soil. Dehusking was found to increase the susceptibility of corms planted in contaminated soil but the presence of husks did not provide effective control. Dehusking did not increase the number of infected young corms from an infected stock planted in new soil. None of the varieties tested was immune or strikingly more resistant than the rest. In small- and large-scale control experiments carried out during 1940–43, the most consistently good results were obtained by treating the corms before planting for five minutes in a 1.0 per cent. solution of mercurous chloride, the disease index [see preceding abstract] following the treatment ranging from 0.0 to 7.2 as compared with from 2.2 to 28.5 in the untreated control; good control was also obtained with mercuric chloride (3 hours in a 0.1 per cent. solution) and warm aretan (15 minutes, or later one hour, in a 0.5 per cent. solution); treatment with folosan and cold aretan gave some control but not consistently. Red copper oxide, formalin, and ceresan were harmful. Treatment of contaminated soil with formalin, mercuric chloride, aretan, or uspulun gave good but not complete control, formalin being the least effective.

LYLE (E. W.). **Control of black spot of Roses with sulphur-copper dust.**—*Bull. Tex. agric. Exp. Sta.* 648, 27 pp., 6 figs., 1 graph, 1944.

Premature defoliation of field-grown roses as a result of infection by *Diplocarpon rosae* [*R.A.M.*, xxiii, pp. 63, 90, 114] has been a major problem with commercial rose-growers in eastern Texas. Following several years' field tests, some sulphur-

copper dusts were evolved which gave better control than pure dusting sulphur; the most effective contained about 90 per cent. 325-mesh dusting sulphur and 10 per cent. of an insoluble copper compound such as '34' copper fungicide, copper hydro 40, cuproicide, Dow copper, Grasselli copper, spraycop, copper oxychloride sulphate, and cupro-K. Unconditioned sulphur was as satisfactory as the conditioned product when used with some of the copper compounds and a 93 per cent. 325-mesh sulphur was practically as good as a 98 per cent. for the dust fungicide. Satisfactory control resulted when treatments were begun with the first symptoms and continued at weekly intervals until 1st July, further applications being made within 24 hours after rain, but not more frequently than once a week, for the rest of the season. The most practical dosage was found to be 15 to 25 lb. dust per acre at each application.

With the susceptible Caledonia rose, the treatment not only reduced infection and increased the weight of the bushes, but also greatly increased the percentage of high-grade bushes. Those grading Nos. 1 and 1½ were increased from 52 to 85 per cent. and the net increase in value given by the treatment was estimated at \$235 per acre, not including the inferior grades.

It was also ascertained that using resistant understocks delayed infection on the scions. Late removal of the understock tops and pruning back to less than half-an-inch all prematurely formed scions resulted in later development of the scions and subsequent delay in infection. Directing the dust down on to the foliage was at least as effective as projecting it upwards from under the leaves. The benefits of the treatment were also apparent after storage.

GÄUMANN (E.). **Über den Fuchsien-Rost.** [On *Fuchsia* rust.]—*Phytopath. Z.*, xiv, 3, pp. 189–191, 1942. [Received November, 1944.]

Having decided that the uredo stage of a rust attacking *Fuchsia splendens* in Zürich greenhouses must belong either to *Cronartium asclepiadeum* or *Puccinias-trum epilobii*, the author carried out cross-inoculation experiments on peony and *Epilobium roseum*, typical hosts of the former and latter species, respectively. The tests were successful only on *E. roseum*, whence the rust was reinoculated into *F. splendens*, so that *P. epilobii* (Pers.) Otth f.sp. *palustris* Gäum. (*Ber. schweiz. bot. Ges.*, li, pp. 338–343, 1941) is evidently implicated. Since the parasite forms no teleospores on *F. splendens* and therefore cannot complete its life-cycle on its alternate hosts (*Abies* spp.), it must be reintroduced year by year into the greenhouse from one of the many susceptible species of *Epilobium* growing as weeds or the cultivated *Godetia amoena* and *G. carminea*, on which *P. epilobii* also occurs. One obvious control measure thus consists in the exclusion of these species from the vicinity of the houses, while another lies in the avoidance of the unduly high temperatures favouring profuse infection.

THIRUMALACHAR (M. J.). **Ergot on *Cynodon dactylon* Pers.**—*Curr. Sci.*, xiii, 11, p. 288, 1 fig., 1944.

Spikelets of *Cynodon dactylon* growing in the vicinity of sugar-cane fields in the Bangalore district of Mysore were observed in the autumn of 1944 to be profusely infected by a species of *Claviceps* closely resembling that collected on sugar-cane in the same locality during the previous year [*R.A.M.*, xxii, p. 315].

DODGE (B. O.). **A new *Pseudonectria* on *Pachysandra*.**—*Mycologia*, xxxvi, 5, pp. 532–537, 13 figs., 1944.

The canker disease of *Pachysandra terminalis* [*R.A.M.*, xxiii, p. 489] in the eastern United States is caused by a new species of Ascomycete, *Pseudonectria pachysandricola* n.sp., the conidial stage of which is *Volutella pachysandricola*. The sporodochia reach up to about 400 μ in diameter. The hyaline, unicellular

conidia, which are pointed at the ends, measure 14 to 24 by 2 to 4 μ . In culture on potato dextrose agar the conidia in mass are salmon pink and vary more in size and shape. The faintly coloured, tapering hairs are 100 to 200 μ long and 5 to 10 μ broad at the base, and may appear as soon as the sporodochium ruptures the epidermis. The sporodochia are usually dully amber or ochraceous or (according to R. P. White) russet. From about the first week in June reddish sporodochia may be found; these are becoming stromata, on which perithecia develop.

The young perithecia are roughly granular, owing to the presence of short, coarse, light yellowish to reddish setae projecting from the wall. The dome of the mature perithecium is generally rather smooth. Orange-red to carmine, the perithecia measure 240 to 280 by 200 to 225 μ . The clavate, eight-spored asci measure 60 to 80 by 8 to 10 μ ; the hyaline, at first uniseriate, becoming irregularly biseriate, narrowly ellipsoid, unicellular ascospores are 10 to 15 by 3 to 5 μ . Cultures from single ascospores resembled those from single conidia. In general, mixed cultures derived from several spores from the same ascus are more brightly coloured and often rather more vigorous than are cultures from single ascospores or conidia.

The cultural characters and the fact that perithecia so frequently develop directly from old sporodochia functioning as stromata provide further evidence of the connexion between the *Volutella* and the perithecial stage. Living leaves and stems inoculated with conidia from ascospore cultures developed typical *Volutella* sporodochia and conidia.

DODGE (B. O.). **Lawn troubles and their control.**—*J.N.Y. bot. Gdn*, xlv, 537, pp. 208–210, 1944.

The available information on the etiology and control of the fungi destroying lawn grass in the United States is briefly summarized, the diseases listed being brown patch, caused by *Corticium vagum* (*Rhizoctonia solani*) [*C. solani*], dollar spot or small brown patch (*Sclerotinia homoeocarpa*), zonate eye spot (*Curvularia lunata*), spot blight (*Pythium* sp.), pink patch (*Corticium fuciforme*), snow mould (*Calonectria graminicola*), and eastern snow mould (*Typhula itoana*) [*R.A.M.*, xxi, p. 142; xxiii, p. 491]. The most reliable fungicides for lawns are mercuric chloride and mercurous chloride, while highly satisfactory results have also been obtained with organic mercury compounds, such as semesan, nu-green, and barbak, as well as with thiosan. In the case of the snow moulds, particular care should be paid to the choice of resistant grass species, velvet bent [*Agrostis canina*], for instance, being substituted for the very susceptible creeping bent [*A. palustris* or *A. maritima*] and red fescue [*Festuca rubra*].

DILLON WESTON (W. A. R.). **Clover rot.** *J. Minist. Agric.*, li, 8, pp. 349–350, 1 fig., 1944.

This brief popular account of clover rot (*Sclerotinia trifoliorum*) is, like earlier contributions in this series [*R.A.M.*, xxiii, 434], illustrated by a chart depicting the life-cycle of the fungus.

FRICKE (E. F.). **Molybdenum deficiency. Field experiments at Cressy, Longford, and North Motton.**—*Tasm. J. Agric.*, xv, 3, pp. 65–70, 1 fig., 1944.

On Cressy shaley clay-loam soil in northern Tasmania great difficulty is found in obtaining satisfactory growths of clover and other legumes by ordinary farm methods, though extra cultivation and liming sometimes give good results for a limited period. Pot culture experiments and field trials on pastures and blue pea crops carried out by the author confirmed the presence of molybdenum deficiency [cf. *R.A.M.*, xxii, p. 484]. In both instances it was shown that while the addition of lime induced a satisfactory response, little effect was produced by lime in the

presence of molybdenum, e.g., as ammonium molybdenate in a soluble form, and it is thought that the chief action of the lime may be to bring the molybdenum in the soil into solution. The responses to molybdates on a crop of blue peas at Cressy were profitable for all quantities from 2 oz. to 1 lb. per acre, the most profitable dressing being $\frac{1}{2}$ lb. per acre.

WHITTAKER (E. C.). **Sterilisation of fruit cases.**—*Agric. Gaz. N.S.W.*, lv, 10, pp. 440–441, 2 figs., 1944.

After pointing out that fruit cases in New South Wales are expensive and often difficult to procure, with the result that thousands are being used more than once for marketing fruit, the author cites a description of a steam sterilization plant designed to treat cases in quantity by G. A. H. Helson and W. T. Bennett. It consists of an iron tunnel 14 ft. long fitted with two endless chain belts driven by a $\frac{1}{2}$ h.p. motor, into which live steam at 80 lb. pressure and a temperature of 310° F. is blown, so that a temperature between 170° and 190° is maintained in the tunnel, depending on whether the machine is run continuously or at intervals. This apparatus treats 1,000 cases per hour. The treatment does not damage the cases, washes them clean, removes all rubbish, dries them quickly, and ensures that the fruit is packed in cases free from pests and fungi.

VINCENT (C. L.). **Vegetable and small fruit growing in toxic ex-orchard soils of Central Washington.**—*Bull. Wash. St. agric. Exp. Sta.* 437, 31 pp., 6 figs., 1944.

The large acreage of former orchard lands lying idle at present in central Washington is stated to be unsuitable for the growing of most vegetable or small fruit crops on account of the toxicity of the soil due to an accumulation of water-soluble arsenic from sprays applied to the orchards over a period of 30 to 40 years. Investigations carried out by the Washington Agricultural Experiment Station showed, however, that asparagus, Irish potato, tomato, carrot, tobacco, dewberry, grape, and red raspberry can be grown successfully on arsenic-toxic soil. The growing of rye as a soil-improvement crop aided greatly in reducing the water-soluble arsenic in the soil and increased the yields of tolerant crops, when these followed the growing and ploughing-under of two or more crops of rye.

OBREGÓN BOTERO (R.). **Algunas enfermedades de las plantas en la zona frutera de Boyacá.** [Some plant diseases in the fruit-growing region of Boyacá.]—*Rev. Fac. Agron., Medellín*, v, 19, pp. 594–633, 1942. [Received November, 1944.]

In the course of a visit of inspection to the orchards of Boyacá, Colombia, which have been greatly neglected, the following diseases were observed: apple scab (*Venturia inaequalis*), mildew (*Podosphaera leucotricha*), bitter pit, black rot or canker (*Phylospora malorum* (Berk.) Shear [*P. obtusa*]); peach leaf curl [*Taphrina deformans*], and a trouble of obscure origin (presumably non-parasitic), resulting in the development of unsightly cavities, sometimes filled with gum, on the fruits and causing heavy losses. Notes are given on the diseases and their control.

SMOCK (R. M.). **The physiology of deciduous fruits in storage.**—*Bot. Rev.*, x, 9, pp. 560–598, 1 graph, 1944.

This critical survey of the literature on the physiological processes undergone by stored deciduous fruits, such as apples, pears, peaches, and plums, embodies a number of allusions to the pathological factors involved, reference to which has been made from time to time in this *Review*. The bibliography comprises nearly 200 titles.

ISAAC (W. E.). **The effect of methyl bromide fumigation on Apples.**—*Fmg S. Afr.*, xix, 224, pp. 703–710, 4 figs., 1944.

Treatment of apples against codling moth (*Cydia pomonella*) by methyl bromide fumigation is apt to produce damaging effects, even low concentrations being injurious to Red Delicious apples and very injurious to Granny Smith. Injury may affect the core or the outer parts, or both. When only the skin is involved, the effect often resembles superficial scald [*R.A.M.*, xxii, p. 212], especially frigesence superficial scald [*ibid.*, xxii, p. 29], except that the fumigation injury develops at all storage temperatures, and occurs within a week or two after treatment. Core injury approximates to core flush [*ibid.*, xxii, p. 212], but develops sooner and appears at the calyx end and spreads towards the stem end. In one consignment of Granny Smith apples a third type of injury was observed; the vapour appeared to have passed upwards from the stalk end and out along the vascular bundles round the core. From there the outer flesh was affected. Attention is drawn to the fact that apples that appear sound outwardly may be affected internally.

OSTERWALDER (A.). **Von rollenden Blättern und vom Apfelmehltau.** [Of rolling leaves and of Apple mildew].—*Schweiz. Z. Obst- u. Weinb.*, liii, 15, pp. 268–271, 1944.

Apart from the rolling of apple foliage associated with various physiological factors, such as an excess of sunlight leading to undue respiratory activity, a form of the trouble was prevalent in Swiss orchards during the summer of 1944 on trees attacked by mildew [*Podosphaera leucotricha*]. The brown, necrotic areas on the epidermis are unable to keep pace with the expansion of the growing leaf, hence the contraction and characteristic distortion. Secondary infections by the fungus are not only more virulent than primary ones but also harder to control, partly because they are difficult to detect in the early stages. However, a most trustworthy indication of their presence is afforded by the foliar rolling or local curvature of the margins, often combined with the delicate, white mycelium on the under side and a pale green spotting of the dark green upper surface. The upward-curving leaf margins, moreover, show a reddish tinge on the dorsal surface.

P. leucotricha, which overwinters in the buds, may easily be combated in the early stages by the excision and destruction of the mildewed shoots. On the other hand, it has not proved amenable to treatment with sulphur dust, colloidal sulphur, or lime-sulphur, and is, in fact, owing to the negligence of growers, spreading from the susceptible Boiken variety to Gravenstein, Landsberg Reinette, Beauty of Boskoop, and others.

BOTTOMLEY (A[VERIL] M.). **Peach mildew.**—*Fmg S. Afr.*, xix, 224, pp. 678, 698, 1 fig., 1944.

Peach mildew (*Sphaerotheca pannosa* var. *persicae*), known in the Union of South Africa for a number of years as a minor nursery trouble, has recently become of importance in the orchard. Appearing first in the western Cape Province, where it is said to attack apricots, nectarines, and peaches, the disease is now present in peach and nectarine orchards in the Transvaal. The symptoms on the fruit consist of white to brownish powdery spots which increase in size and number until they cover large areas; young affected fruits often look as if splashed with whitewash. The flesh hardens, the skin turns brownish, and the peach finally cracks. Poor drainage, waterlogging, irrigation, and thick planting are said to favour severity of attack.

Growers in localities where the disease has just appeared should remove early infected shoots and fruits, and treat the trees with sulphur dust, wettable sulphur (5 to 6 lb. in 100 gals. water), or lime-sulphur (1 in 200), all of which appear to

have given good results in the western Cape Province. Spraying should be effected at monthly intervals, beginning as soon as the blossoms drop, while sulphur-dusting probably requires to be carried out at intervals of two or three weeks. A further treatment, consisting of lime-sulphur (1 in 15), should be applied in winter, just as the buds begin to swell.

BERKELEY (G. H.) & CHAMBERLAIN (G. C.). **Diseases of the Raspberry.**—*Fmrs' Bull. Canad. Dep. Agric.* 123 (revised), 11 pp., 3 pl., 1944.

The available information on the virus, fungal, bacterial, and non-parasitic diseases affecting the Canadian raspberry crop is summarized [cf. *R.A.M.*, x, p. 392].

ROSS (A. A.). **Little-leaf in the Custard Apple.**—*Qd agric. J.*, liii, 3, pp. 158-160, 2 figs., 1944.

Custard apple (*Annona cherimolia*) trees in the Sunnybank district of south-eastern Queensland have recently developed the typical symptoms of zinc deficiency (little leaf) on an extensive scale. The disorder, which mainly affects young trees (up to seven years), is characterized, as in the apple, by the cessation of growth on one or more of the leaders and the production of small, mottled leaves, sometimes followed by a gradual die-back of the shoots from the tip to the site of insertion on the trunk. The application of a spray consisting of 10 lb. zinc sulphate and 5 lb. hydrated lime per 100 gals. water twice during the summer growing period restored severely stunted trees to normal health.

DION (W. M.) & LORD (K. A.). **A comparison of the toxicity of certain dyestuffs to the conidia of *Fusarium culmorum*.**—*Ann. appl. Biol.*, xxxi, 3, pp. 221-231, 5 diags., 1944.

With a view to determining whether any correlation could be found between toxicity and chemical structure of dyestuffs, the author tested the action of a number of them, by the standard slide-germination technique, on spores of *Fusarium culmorum* and *Cercospora herpotrichoides*. No attempt was made to distinguish between fungistatic and fungicidal activity. It was found that the toxicity of basic dyestuffs was not affected by the acid radicle associated with the dye base. The high toxicity to *F. culmorum* of malachite green dye base was reduced weight for weight and mole for mole by the substitution of ethyl, propyl, or butyl for methyl groups; the toxicity was entirely removed by the reduction to malachite green *leuco*. The substitution of amino and alkylated amino groups in benzene nuclei of triphenyl methane increased toxicity, whereas acid groups lowered it, and sulphonation and carboxylation reduced it to vanishing point. The toxicity was increased by alkylation of amino groups but was not appreciably affected by alkylation of benzene nuclei. The replacement of the central carbon atom of the triphenyl methane dyestuffs by nitrogen (e.g., Bindschedler's green) made these compounds more toxic than the corresponding diphenyl ammonium compounds. The prevention of rotation of the animated benzene rings by bridging, in the *ortho*-position to the central atom, with oxygen or nitrogen, and thus obtaining a planar molecule, had only a slight effect on toxicity. Certain acid dyes were found to stimulate fungal growth. The results are taken to indicate that the toxicity of the basic dyestuffs depends not on one specific part but on the molecule as a whole, and within certain limits the structure may be varied without pronounced changes in toxicity.

VERNE BOWEN (C.). **Organic iodine compounds tested against insects, fungi, and bacteria. A review of the literature.**—20 pp., New York, Iodine Educational Bureau, Inc., [1944].

This is a list of the organic iodine compounds so far tested against insects, fungi,

and bacteria, with notes on their activity in this respect accompanied by references to the relevant literature. The bibliography comprises 111 titles and there is a list of the patents cited.

CARPENTER (C. W.). **Fusarium disease of the Prickly Pear.**—*Hawaii. Plant. Rec.*, xlviii, 2, pp. 59–63, 3 figs., 1944.

A destructive disease of prickly pear (*Opuntia megacantha*) was observed at Kakaha, Hawaii, in November, 1943, characterized by a progressive softening of the whole 'pad' or cladode, which became grey to fuscous, collapsed, and fell. Sometimes, much exudate oozed from the ruptured surface and dried as a firm gum, secondary bacteria hastening the destruction with the formation of gas which caused the affected part to swell.

A *Fusarium* and two strains of bacteria were isolated from affected material. When healthy pads were inoculated with the three organisms, alone and in every combination, typical rot developed only when the *Fusarium* was present in the inoculum. In a later test, inoculations of detached pads with the fungus gave 100 per cent. positive results. Numerous inoculations of 12 prickly pear plants growing in the open were made hypodermically with spore suspensions of pure cultures of the reisolated *Fusarium*. In ten days the fungus had infected the pads at every inoculation point. In most cases, the inoculated pads rotted and dropped in three weeks, while smaller inoculated plants were rotted to the ground.

The fungus was identified as a variety [unspecified] of *F. oxysporum* with an odour characteristic of several species of the section *Elegans*; the macroconidia measured 35 to 55 by 4 to 5 μ .

In the more fertile sections of the Hawaiian islands the prickly pear is looked upon as a detested weed which renders large areas of the best land useless. In such localities any disease of this host would be welcomed.

GUBA (E. F.) & SEELER (E. V.). **Studies on the identity and control of stilbaceous mold in gas purifying sponge.**—7 pp., 5 figs., American Gas Association, 1944. [Mimeographed.]

In July, 1943, the authors' attention was directed to a fungal infection of the gas-purifying sponge used at the Everett, Massachusetts, plant of the Boston Consolidated Gas Company. In some boxes the growth partly obstructed the flow of gas. The fungus was characterized by dark, cylindrical bundles of hyphae with dark conidial heads and by fertile, creeping, branching hyphae sporulating at the extremities. Short conidiophores with a single apical conidium arising laterally along the hyphae were also noted. The conidia were one-celled, ovate to oblong to long piriform. The organism was identified by D. H. Linder as *Sporocybe borzinii* Goidànich [*R.A.M.*, xvii, p. 559] (= *Petriella lindforsii* Curzi).

Temperatures of 180° F. for one minute or 150° for 15 minutes intimately applied to the fungus were ascertained to be lethal after proper distribution of the heat, while growth was completely inhibited by an initial highly alkaline reserve in the sponge and the maintenance of alkalinity above $P_H 10$. Control methods suggested consist in the injection of steam into the sponge and purification structure and its confinement long enough to obtain a uniform lethal temperature, or in the injection or diffusion of formaldehyde into the boxes by steam siphon, or by the action of potassium permanganate. Wetting down the top layer of sponge with formaldehyde 1 in 50 or with a 0.2 solution of santobrite (sodium pentachlorophenate 85 per cent.) is also suggested. Sterilization of the wood shavings or ready-made sponge with heat or chemicals is desirable.

CASS SMITH (W. P.). **Some aspects of plant pathology in Western Australia.**—*J. Aust. Inst. agric. Sci.*, x, 3, pp. 93–101, 1944.

In this presidential address, delivered before the Western Australia branch of

the Australian Institute of Agricultural Science on 23rd June, 1944, the author briefly reviews the efforts made to cope with plant diseases in Western Australia from about the middle of the nineteenth century until to-day, discusses the contributions made to agricultural progress by plant pathology in the State during the past 33 years, and indicates the scope and nature of the work at present being carried out.

MORROW (MARIE B.) & RACHANER (M. GERMAINE). **Fungus slide cultures: new methods.**—*Trans. Tex. Acad. Sci.*, 1943, xxvii, pp. 114–116, 1944.

Distinctive features of the slide culture technique for mould study developed at the Department of Botany and Bacteriology, University of Texas, include the dispersal of the inoculum in 1 per cent. glycerine water; the spreading of the medium (Waksman's agar) in a ribbon-like streak or so as to form a roughly circular area several mm. in diameter; the incubation of the prepared slide, placed agar side upwards crosswise over another slide in a 'moist chamber' consisting of a Petri dish with a few drops of sterile water in the bottom; and the use of lactophenol [*R.A.M.*, ix, p. 260] as a combined fixing-staining-mounting medium. Some growth should become apparent after 24 hours, but the development of fructifications may require a period of up to 72 hours, or even a week in the exceptional case of *Chaetomium*.

CAVALLITO (C. J.) & BAILEY (J. H.). **Preliminary note on the inactivation of antibiotics.**—*Science*, N.S., c, 2600, p. 390, 1944.

The authors isolated from *Allium sativum* an antibiotic active against Gram-positive and Gram-negative organisms and rapidly inactivated by cysteine. Other antibiotics of thallophyte and spermatophyte origin were tested in the presence of cysteine, and in every case complete inactivation or marked reduction in antibiotic activity resulted. Gram-positive antibiotic activity was more susceptible to cysteine inactivation than Gram-negative activity.

The inactivation observed is regarded as unusual in the light of the widely different chemical types of antibiotics concerned. In those substances where the nature of the reaction of cysteine is known, cysteine reacts irreversibly with the antibiotics. The suggestion is made that perhaps the fundamental mode of action of certain classes of antibiotics involves their ability to interfere with the normal function of sulphydryl groups in bacterial metabolism.

SHWARTZMAN (G.). **Enhanced production of penicillin in fluid medium containing cellophane.**—*Science*, N.S., c, 2600, pp. 390–392, 2 graphs, 1944.

When cellophane bags of suitable surface were added to fluid culture media the growth of the submerged and surface penicillin-producing strains of *Penicillium notatum* became faster and more abundant, and penicillin appeared earlier and reached higher concentrations in larger total volumes than in the control cultures without cellophane. Enhancement also occurred under conditions unfavourable for penicillin development, i.e., (a) with degenerated cultures, and (b) when the surface penicillin-producing strain was grown in cultures with an unfavourably small surface area/total volume ratio (0.0315). In addition, the cellophane exercised a conspicuously stabilizing effect upon the H-ion concentration of abundantly growing cultures during the active production of penicillin. This stabilization has significance, as the sharp rise in P_H value usually noted in *Penicillium* cultures tends to the rapid destruction of the penicillin.

It is stated in a footnote that in later experiments an even greater and faster production of penicillin was obtained by the use of cellophane strips instead of bags.

BURKHOLDER (P. R.), EVANS (A. W.), McVEIGH (ILDA), & THORNTON (HELEN K.).

Antibiotic activity of lichens.—*Proc. nat. Acad. Sci., Wash.*, xxx, 9, pp. 250-255, 1 fig., 1944.

When the anti-bacterial activity of the extracts from 42 species of lichens was determined by means of the cup plate procedure, it was found that 27 species were active against *Bacillus subtilis* or *Staphylococcus aureus*, four against *Proteus vulgaris* or *Alcaligenes faecalis*, but none against *Escherichia* [*Bacterium*] *coli*.

STANLEY (N. F.). **Aspergillin, a stable antibacterial substance of high potency produced by a species of Aspergillus.**—*Aust. J. Sci.*, vi, 5, pp. 151-152, 1944.

Preliminary investigations on the composition of aspergillin, a crystalline compound isolated from the metabolic fluid of a strain of *Aspergillus* grown for five days at 24° C. on Czapek-Dox agar by Hobby *et al.* (*Proc. Soc. exp. Biol.*, N.Y., 1, p. 277, 1942) indicate the presence of carbon, hydrogen, oxygen, and sulphur. Gram-positive organisms are much more susceptible to its action than those of the Gram-negative group. In the writer's experiments the bacteriostatic titres range from 1 in 160,000 for *Salmonella typhi* to 1 in 40,960,000 for *C[orynebacterium] diphtheriae gravis*. The strongest aqueous solutions obtained were non-toxic to laboratory animals and leucocytes. The anti-bacterial property of aspergillin is not neutralized by serum, peptone, or yeast extract, or destroyed by boiling at any P_H between 1.5 and 8.

TATUM (E. L.). **Biochemistry of fungi.**—*Annu. Rev. Biochem.*, xiii, pp. 667-704, 1944.

In his review of recent contributions to the knowledge of fungal biochemistry, comprising 333 titles, the author endeavours to correlate new developments in this subject with the general concept that genetic controls, similar to those operating in the case of *Neurospora*, are responsible for many of the varied biochemical activities of fungi. The thesis is expounded under the following headings: vitamin and growth-factor requirements, vitamins and respiratory functions, genetic basis of growth-factor and vitamin requirements, genetic control of other biochemical reactions, sexual phases and biochemical reactions, induction of mutations or variants in fungi, symbiosis and related problems, biosynthesis of vitamins, growth factors, and amino acids, adaptation and changes in synthetic capacity, inhibitions, cultural specificity and cultural conditions affecting mould products, nature and action of antibiotic agents from fungi, interrelationships of mould products, and miscellaneous.

RAYNER (M[ABEL] C.) & NEILSON-JONES (W.). **Problems in tree nutrition.**—184 pp., 27 pl., 1 diag., 10 graphs. London, Faber & Faber Ltd., 1944. 12s. 6d.

The subtitle of this book, to which a foreword is contributed by H. M. Steven, Department of Forestry, University of Aberdeen, describes it as 'an account of researches concerned primarily with the mycorrhizal habit in relation to forestry and with some biological aspects of soil fertility'. Of the six chapters, Nos. II to V were published as a series of papers in *Forestry* at intervals between 1934 and 1941 [*R.A.M.*, xiv, p. 410; xv, 737; xix, p. 36; xxi, p. 298], and VI in *J. agric. Sci.*, in the latter year. Each chapter is followed by a summary, and a bibliography of 58 titles and a glossary are appended.

HÖFLER (K.). **Über Kalkchlorose und Calcirose im Jahre 1941 und W. S. Iljins biochemische Untersuchungen.** [On lime-induced chlorosis and calciosis in the year 1941 and W. S. Iljin's biochemical investigations.]—*Phytopath. Z.* xiv, 3, pp. 192-203, 1942. [Received November, 1944.]

Among the plants affected by an exceptionally severe form of 'lime-induced

chlorosis' in the environs of Vienna in 1941 were vine, apple, pear, quince, *Robinia [pseudacacia]*, ash, tree of heaven [*Ailanthus glandulosa*], wild rose, elder, privet, Dutchman's pipe [*Aristolochia siphon*], *Cornus mas*, and *C. sanguinea*, and in this connexion a full account is given of W. S. Iljin's biochemical studies on the disturbance (*Jb. wiss. Bot.*, xc, p. 464, 1942) [cf. also *R.A.M.*, xxiii, p. 374], together with references to the work of Schander on juvenile chlorosis in lupins [*ibid.*, xviii, p. 530] and other relevant investigations.

Discussing the name 'lime-induced chlorosis', the writer points out that it is strictly applicable only to the later stages of the trouble, and not to the earlier phases, in which the chlorophyll content of the leaves is still undiminished, though chemical changes have already taken place in the tissues, notably the accumulation of citric acid. The term 'chlorosis', moreover, was first used by Gris in France in 1843 to describe a condition due to iron deficiency, for which it ought, on grounds of priority, to be still reserved. In view of its widespread usage in phytopathology such a course would now be impracticable, but it is at any rate misleading to designate as 'chlorotic' foliage in which no sign of yellowing or bleaching is apparent. The name of 'calciosis' is therefore proposed to express the symptoms of deranged metabolism in plants of a calcifuge habit on calcareous and dolomitic soils.

SCHULTZ (E. S.), BONDE (R.), & RALEIGH (W. P.). **Early harvesting of healthy seed Potatoes for the control of Potato diseases in Maine.**—*Bull. Me agric. Exp. Sta.* 427, 19 pp., 1944.

Evidence is presented demonstrating the benefits obtained in the control of seed potato virus diseases in Maine by early harvesting before the viruses have had time to reach the tubers.

In 1935, an experiment was started to determine the extent to which different strains of seed potatoes could be maintained in a virus-free condition by roguing the seed plot and early harvesting. One strain of Triumph and two of Green Mountain were used, the seed plot being 200 to 1,000 ft. from commercial fields. It was planted as early in the season as possible with early-harvested potatoes selected from the seed plot the previous season. During the last week in June and each week in July the diseased plants discovered were removed. The tops in the seed plots were pulled by hand before aphids appeared. Hills were dug and kept separate, and the following year planted as hill units. If any plant in a hill unit showed disease, the whole unit was discarded.

The data obtained with the Triumph variety showed that although it is very difficult to produce healthy Triumph seed potatoes locally, disease-free seed was produced in six of the eight years the experiment lasted. In 1936, only 0.5 per cent. mosaic was present, and in 1937 only 2.9 per cent. In both years, a few aphids were found in the seed plot at harvesting and in 1937 a severely diseased field was located only 200 ft. away. In 1940 and 1941 tubers were harvested late. Those harvested on 20th September, 1940, had 48 per cent. severe mosaic and 65 per cent. leaf roll, while those harvested on 24th September, 1941, had no mosaic, but 44 per cent. leaf roll.

Data obtained with a Vermont strain of Green Mountain propagated from 1935 to 1943 showed that early harvesting (the earliest date ranging from 25th July to 7th August) prevented virus spread in six years and restricted it considerably in the other three. Thus, in 1936, only 0.2 per cent. of the early-harvested seed stock had mild mosaic; in 1937, 0.5 of that harvested on 7th August had mild mosaic, and 0.8 per cent. had leaf roll. In 1940, 1 per cent. of the stock harvested on 31st July showed mosaic. No disease was present in the stock harvested as late as 13th August, 1939, 16th August, 1942, or 28th August, 1943. There was little or no disease in samples harvested by the first week of August; disease increased as

the season advanced; and by late August and during September stocks were in most cases badly infected.

When the tests were extended to farms in eight different localities, in all cases early harvesting materially reduced the amount of disease. In no instance did early harvested seed potatoes show over 1.6 per cent virus disease.

Ring spot [*Corynebacterium sepedonicum*] was not found. Growers are warned not to harvest seed plots while the foliage is green if late blight [*Phytophthora infestans*] is present. Potato tops were successfully killed by spraying with a solution of sinox (2 gals.) and ammonium sulphate (10 lb.) per 100 gals. water or with 'handy killer' (sodium arsenite), 4 pints per 100 gals. water. Treating freshly dug tubers with formaldehyde solution (1 pint in 30 gals.) or Bordeaux mixture (3-3-100) greatly reduces tuber decay by *P. infestans*.

If growers would practise early harvesting it is probable that ring rot would be eliminated and virus diseases controlled, so that epidemic outbreaks of the latter would at least be greatly reduced.

SCHULTZ (E. S.) & BONDE (R.). **The effect of latent mosaic (virus X) on yield of Potatoes in Maine.**—*Amer. Potato J.*, xxi, 10, pp. 278-283, 1944.

Field studies conducted in Maine in 1939 showed that latent mosaic caused by potato virus X is harboured more generally than any other virus disease by most of the old and some of the new potato varieties, causing typical mosaic symptoms in some and no symptoms at all in others. The strains of the virus varied in their severity, the stronger strains producing more severe foliage symptoms and causing greater losses in yield than the weak strain. Latent mosaic was found to be responsible for 9 to 22 per cent. reduction in yield, representing annual losses of millions of bushels. Virus X in combination with other viruses affects the potato even more adversely than when alone. Thus, mild mosaic caused by potato viruses A+X reduced the yield by about 25 per cent. For control of latent mosaic it is advisable to grow healthy seed potatoes in isolated fields, as susceptible varieties contract the disease by contact with the foliage of infected plants. From ten years' experience with Green Mountain potatoes infected with weak virus X, which failed to contract the common strain of the virus although grown in alternate rows with plants carrying it, and from several years' tests with Chippewa potatoes showing a similar behaviour, it is concluded that serious losses can probably be prevented by protective inoculation of very susceptible varieties with the weak strain of the virus. Another method of control lies in the direction of breeding varieties immune from virus X, as immunity was found to persist in progenies of virus X-immune parents.

SCHAAL (L. A.). **Variation and physiologic specialization in the common scab fungus (*Actinomyces scabies*).**—*J. agric. Res.*, lxi, 5, pp. 169-186, 1 col pl., 6 figs., 3 graphs, 1944.

In studies started at the Aroostook Farm, Maine, and continued at the Plant Industry Station, Maryland, and at the University Farm, Minnesota, single-cell cultures of *Actinomyces scabies* [*R.A.M.*, xxiii, p. 331], obtained from potatoes grown on various soil types in different States, were found to differ in colour of mycelium and of pigment produced on the modified potato dextrose agar. The isolates were unstable and produced variants which differed from the parents and from each other. Most colonies sectored freely, but one variant did not sector at all during three months' observation. The average size of mycelial cells varied, but was in no isolate greater than $2.5\ \mu$ in length. Some isolates produced spirals while others did not. Aerial mycelium grew most rapidly and produced the greater number of sectors on a medium containing thiamine, but was inhibited by media

with high nitrogen content. On potato dextrose agar four isolates grew somewhat better at 20° to 24° C. than at 18°, and the size of sectors, which were produced at all temperatures, was smaller at the lower temperature. Of the ten isolates grown on the same medium adjusted to P_{II} 5 to 8.5, five had made very little growth after 60 days at P_{II} 5; sectors were produced at all P_{II} values except 5. When a number of isolates was tested on three commercial and five seedling varieties of potatoes they were found to differ in pathogenicity, but no definite correlation could be detected between pathogenicity and cultural or other characteristics. Variants appeared to differ from their parent cultures in pathogenicity. Certain strains caused russetting in normally smooth-skinned varieties.

BEARE (J. A.). **Potato scab and seed piece decay. Control by seed treatment.**—*J. Agric. S. Aust.*, xlviii, 1, pp. 12–13, 1 fig., 1944.

In trials against potato scab [*Actinomyces scabies*] and seed-piece decay conducted in 1944 in South Australia the treatments used were (1) dipping the tubers in a new proprietary organic mercurial compound at 2 oz. per 10 gals. water before cutting, (2) and (3) at 4 and 8 oz., respectively, per 10 gals. before cutting, (4) and (5) at 2 and 4 oz., respectively, per 10 gals. after cutting, (6) undipped, tubers cut immediately before planting, (7) dipping in zinc oxide 5 lb. per 10 gals. after cutting [*R.A.M.*, xxii, p. 370], (8) undipped, tubers cut one week before planting, and (9) dipping in 2 oz. mercurial dip and 5 lb. zinc oxide per 10 gals. after cutting. Except in treatment (8), all the tubers were cut, treated, and planted on the same day.

Germination was excellent, and none of the dip treatments appeared to injure the young shoots or cut surfaces. The percentages of scab (slight plus moderate) were, respectively, 4.2, 0.6, 0.3, 2.5, 3, 25.8, 1.4, 30, and 0.5. Treatments (6) and (8), which were not dipped, differ significantly from the others, but the remaining differences are not significant. The mercurial compound was effective at all strengths and is recommended for use at 2 to 4 oz. per 10 gals. The zinc oxide was as effective as the mercurial. The commercially significant scab in plots from untreated seed was approximately 10 per cent., representing a loss of 1 ton per acre.

HARTMAN (R. E.) & AKELEY (R. V.). **Potato wart in America.**—*Amer. Potato J.*, xxi, 10, pp. 283–288, 1944.

The spread of potato wart (*Synchytrium endobioticum*) [*R.A.M.*, xxiii, p. 276] in the United States is stated to have been controlled by temperature and moisture relationships, by the use of immune varieties, and by strict regulations applied to the importation of foreign potatoes as well as those governing the growing of potatoes in the infested area. So far no new biotypes of the fungus, such as have been discovered recently in Europe [*ibid.*, xxiii, p. 405], had been observed in the United States, but there is no assurance that new forms, which are more virulent and have a wider range of adaptation, will not be found.

In tests conducted in Pennsylvania from 1933 to 1943, 14 new American potato varieties and the Dutch variety President were tested for wart resistance. Katahdin, Mohawk, Sequoia, Mesaba, and Norkota proved to be immune, and Houma very resistant; all six have Katahdin as their male parent. The varieties Chippewa, Sebago, Golden, Erie, Earlane, President, Earlane 2, Potomac, and Warba were susceptible. In a total of 117 seedlings from 14 crosses and two selfed lines, segregation for resistance occurred in ten lines, seven of which had Katahdin for a parent. Two selfed lines of that variety showed, after grouping, about 50 per cent. of their seedlings to be very resistant. Of the 60 other seedling varieties of value as parents and commercial sorts tested, 11 were found to be immune, four very resistant, and 45 susceptible.

WAGER (V. A.). **Dusting Potatoes for late blight.**—*Fmg S. Afr.*, xix, 224, pp. 681–687, 1944.

In many parts of South Africa, 1942, 1943, and the early part of 1944 were very wet, with the result that *Phytophthora infestans* increased in intensity until nearly every patch of potatoes became attacked, the disease occurring in many localities where it had never been seen before. Early in 1944 it swept through vast areas of the Orange Free State, where most of South Africa's table potatoes are produced, and almost completely destroyed the crops. In previous years, attacks have been mainly confined to certain areas, such as George and Knysna in the Cape, the midlands of Natal, and the mist-mountains at Haenertzberg, Transvaal, infection elsewhere being sporadic.

Experimental treatments with copper-lime dust carried out from 1942 to 1944 in various parts of the Natal midlands, using a hand duster and 50 to 80 lb. dust per acre, according to the number of applications, in all cases gave increases in yield, which in some instances reached 40 to 60 bags (1 bag = 150 lb.) per acre. As the cost of the dusting was only about £2 per acre (plus labour), this represented a considerable financial gain.

MCCALLAN (S. E. A.) & CHAN (S. Y.). **Inducing sporulation of *Alternaria solani* in culture.**—*Contr. Boyce Thompson Inst.*, xiii, 7, pp. 323–335, 1 fig., 2 graphs, 1944.

A further study of the factors influencing spore production by *Alternaria solani* in culture [cf. *R.A.M.*, xxiii, p. 139] showed that undisturbed cultures of most isolates produced few or no spores, potato dextrose agar cultures scraped and placed on a window-sill sporulated more or less readily, and that other media or the addition of vitamin B components, in conjunction with scraping and exposure on a window-sill, were without effect or no better than potato dextrose agar.

Maximum vegetative growth and sporulation on scraped cultures occurred at 20° C., but at the optimum temperature sporulation tended to increase with decrease in relative humidity. Even, however, with optimum temperature and humidity, sporulation did not equal that of the controls on the window-sill.

Cultures exposed to an open mercury arc lamp gave, under favourable conditions, 10,000,000 spores per Petri dish culture. Scraped cultures produced a maximum of spores after about 20 seconds' exposure, whereas unscraped cultures required longer, and produced less than one-sixth as many spores. Scraping before or after irradiation made no significant difference in the spore yield. Maximum yields were obtained at 10 cm. distance from the lamp and with cultures two weeks old. After scraping and irradiation there was a pronounced optimum at 20° for greatest sporulation.

Irradiation through coloured glass filters strongly affected sporulation, which increased as the wave-length transmitted decreased. The greatest sporulation resulted with filters whose lower limits of transmission ranged from 249 to 254 m μ . The spores from irradiated cultures were as infective as those from cultures exposed on the window-sill.

It is concluded that maximum sporulation by *A. solani* (Maine strain 52) is induced by growing on potato dextrose agar for two weeks at 20°, scraping, exposing to ultra-violet irradiation for 20 seconds with lamps or filters transmitting to about 250 m μ , and returning to incubation at 20° for two days.

ROSE (D. H.) & SCHOMER (H. A.). **Relation of heat and desiccation to bacterial soft rot of Potatoes.**—*Amer. Potato J.*, xxi, 6, pp. 149–161, 2 figs., 1 graph, 1944.

Symptoms of heat injury, such as are commonly observed in the field on potatoes harvested in warm or hot weather, were experimentally induced in freshly dug potatoes by exposing the tubers to the rays of infra-red lamps emitting a heat energy approximately equal to that of sunlight on an average clear summer day.

The symptoms, a blackening of the skin and of the underlying flesh and oozing of lenticels in the darkened area, appeared after about two or three hours' exposure, when the temperature of the potato tissue (at tuber surface) rose to 135° to 140° F. or higher, although in a few instances injury was noted at 125° to 127°. Measured by small thermocouples half-an-hour after the start of the experiment, the surface of the potatoes was found to be about 16° warmer than the air 1 in. above it; and after two hours and 20 minutes 32° (or in another test 42°) warmer, indicating an accumulation of heat in the potatoes far in excess of the temperature of the surrounding air. This leads to the conclusion that heat injury may occur in freshly dug potatoes when air temperatures are not excessively high, a view supported by observations made in the field in Virginia in 1938 and in Nebraska in 1942. Maturity appeared to have no effect on susceptibility to heat injury, but freshly dug potatoes were much more susceptible than those that had been held in dry air in the laboratory for two or three days.

In experiments with skinned and unskinned potatoes exposed to infra-red light, air and tissue temperatures at the skinned places (each 1 sq. in. in area) were in all cases lower, sometimes much lower, than those on the surface of unbroken skin. In one extreme instance, the differences between skinned and unskinned areas at the end of the experiment were 15° at the surface, 18·6° just under the surface, and 21·7° $\frac{7}{16}$ in. above the surface. These differences are explained by the absorption of heat through evaporation of moisture from the skinned surface. This evaporation is stated to be so rapid that it can cause noticeable sinking or pitting of the flesh in 15 mins.

When, following exposure to infra-red lamps, potatoes were placed in moist chambers at 90°, all unsterilized lots developed typical bacterial soft rot (*Erwinia carotovora* and *E. aroidae*) [*R.A.M.*, xx, p. 489] after 24 hours, while those which had been previously disinfected with mercuric chloride developed no decay after a week, indicating that heat injury and bacterial soft rot (the symptoms of which are often considered to be characteristic of sun scald) are two distinct phenomena and that the rot follows the injury only when bacteria are present and conditions are favourable for their growth. It is pointed out, however, that under field conditions bacteria are commonly present. The development of bacterial soft rot in transit depends largely on transit temperatures, provided that, prior to shipment, the potatoes have been subjected to conditions predisposing them to the rot. It is evident that potatoes which have been promptly handled at harvesting are less likely to develop transit decay than those that have lain in the sun for several hours before being picked up.

The browning and subsequent shrivelling of skinned potatoes exposed to dry air either during harvest or in transit is stated to be a more frequent cause of loss than bacterial soft rot, because, unlike the rot, it can develop at moderate temperatures (60° to 70° or even lower). Occasionally the skinned areas turn almost black and sticky with bacterial or mould growth of a type different from bacterial soft rot. All the commercial varieties observed were susceptible to browning, the most resistant being Sebago which, apparently for this reason, is replacing the susceptible Katahdin in some of the large producing regions of the South. As an exposure of skinned potatoes to drying winds in the field for as little as 15 to 30 minutes had at times resulted in browning and stickiness and a considerable lowering in the commercial value of a shipment, the prompt picking-up of potatoes after digging, advocated above against bacterial soft rot, is also recommended for the prevention of this disorder.

KNORR (L. C.). **Efficacy of the rotary knife in the control of Potato ring rot.**—*Amer. Potato J.*, xxi, 9, pp. 250–261, 1944.

In both of two factorial experiments on the control of potato ring rot (*Coryne-*

bacterium sepedonicum) [*R.A.M.*, xxiii, p. 147] by means of the rotary cutting knife, two mercuric chloride cut seed dips, and ultra-violet light, the rotary knife gave the highest yields of healthy and total tubers. It also significantly reduced the amount of affected tubers. In both tests, the mercuric chloride gave the best control of ring-rot spread, but it produced the smallest crop of healthy and total tubers. A high correlation was obtained between stand and yield, indicating that the yield of total tubers (healthy and diseased) depended on the effect of any particular treatment upon emergence.

HANSFORD (C. G.). **A probable virus disease of Sweet Potato.**—*E. Afr. agric. J.*, x, 2, pp. 126–127, 1944.

In March, 1944 sweet potatoes growing at Kawanda were found to be affected by a disease which was subsequently ascertained to be probably widely distributed in Uganda, to occur in Ruanda-Urundi and the adjoining areas of Tanganyika Territory, and to be present, apparently, to a serious extent in the district west of Lake Albert, in the Belgian Congo, where the crop has had to be virtually abandoned as a food supply for the Kilo Mines. The disease is thus potentially of serious importance in those parts of East Africa where the sweet potato is a major source of food supply. Both in the Belgian Congo and at Kawanda, white flies (*Aleyrodidae*) have been found in large numbers in affected plots, and are suspected to be the vectors.

The symptoms vary widely with the host variety. Some narrow-leaved varieties show severe stunting; the field has a yellow-green appearance, and individual plants grow very slowly, have small leaves, and show an excessive branching of the vines, with short internodes. The leaves generally display an indefinite mosaic of light and dark green areas or, in other varieties, a light yellowish-green banding along the veins. Older leaves frequently present bronzing of the entire leaf or of indefinite, scattered parts of the lamina. Enations were not observed. Broad-leaved varieties reveal more variation in leaf symptoms and reaction to infection. The Six Week variety shows almost complete infection, with pronounced mottling or mosaic of the leaves but little or no dwarfing; older leaves are slightly bronzed. Other broad-leaved varieties show mottling or mosaic or veinbanding, in some with distortion of the leaf shape, in others with leaf-crumpling, while parts of the leaf may be distinctly thick and tough. Most varieties show bronzing of the older leaves. On varieties which normally develop a red or purple pigment in the leaves and stems the symptoms are extremely obscure, particularly when dwarfing is absent.

Control resolves itself into the development of a resistant variety. Surveys should be made to determine the distribution of the disease and precautions should be taken to prevent its introduction into new areas.

PRESLEY (J. T.). **A disease of Guayule caused by *Sclerotium bataticola*.**—*Plant Dis. Rept.*, xxviii, 30, p. 936, 1944. [Mimeographed.]

Sclerotium bataticola [*Macrophomina phaseoli*] was responsible for heavy losses in two-year-old dry-land guayule [*Parthenium argentatum*] plantings in south Texas during July and August, 1944. In a field spacing experiment, in which the plants were set at three distances apart, 6.6 per cent. of those in the 40 in. rows were diseased on 31st July and 10.3 per cent. on 22nd August, the corresponding figures for 20 and 10 in. being 3.8 and 8.9 and 2.2 and 6.5 per cent., respectively.

EATON (F. M.). **Deficiency, toxicity, and accumulation of boron in plants.**—*J. agric. Res.*, lxi, 6, pp. 237–277, 2 col. pl., 2 figs., 3 graphs, 1944.

In experiments carried out at Riverside, California, from 1930 to 1934, to obtain comparative data on the symptoms, growth reactions, and boron accumulation

characteristics of different plants, 50 species (58 varieties) of plants were grown in each of six large outdoor sand cultures supplied, respectively, with 0.03 to 0.04, 1, 5, 10, 15, and 25 p.p.m. of boron.

Approximately 25 per cent. of the plants made best growth in the trace-boron culture, while others responded to 1 p.p.m. or more. The growth of some species was increased by 10 and 15 p.p.m. Twenty varieties showed morphological symptoms of boron deficiency in the trace-boron culture, and the maturity of four varieties was markedly affected at this level. The evidence indicated that there is much overlapping between the injurious and beneficial effects of boron within plants, mild to marked leaf injury occurring in 19 of the 72 plants at or below the substrate concentrations that gave the best growth.

The boron concentrations (dry-weight basis) in leaves of plants growing in 5 p.p.m. of boron ranged from 58 to 1,804 p.p.m. and in 25 p.p.m. of boron from 209 to 3,875 p.p.m. Concentrations in roots, stems, and fruit were generally much lower than in the leaves, while in entire plants they averaged about half that in the leaves. Numerical values for tolerance ranged from under 10 to over 200 p.p.m. Ratios of boron concentration in leaves to boron in the trace-boron nutrient were mostly between 400 and 1,200, and in 1 p.p.m. of boron between 50 and 200. Lower ratios were found when the boron concentrations of the substrates were higher.

In a number of plants, boron deficiency was most marked under climatic conditions that restricted the movement of boron from the leaves to the other tissues. Apparently, factors affecting the movement and distribution of boron in the plant may be almost as important in determining boron requirements as the boron-supplying ability of the substrate.

SHANOR (L.). **Additional records of aquatic Phycomycetes isolated from Mexican soils.**—*J. Wash. Acad. Sci.*, xxxiv, 10, pp. 330–333, 1944.

An annotated list is presented of 14 species of aquatic Phycomycetes isolated from Mexican soils, including *Achlya flagellata*, *Pythium debaryanum*, and *P. graminicola*.

SKINNER (C. E.) & MELLEM (ETHEL M.). **Further experiments to determine the organisms responsible for decomposition of cellulose in soils.**—*Ecology*, xxv, 3, pp. 360–365, 1944.

When finely divided filter paper was added to acid soils 60 per cent. saturated with water there was no evidence of activity by cellulose-decomposing bacteria, in the presence or absence of nitrates, though mould growth increased considerably. In soils whose initial P_H value was over 5 both moulds and cellulose-decomposing bacteria showed a significant increase. The conclusion of R. J. Dubos that both aerobic bacteria and moulds take part in the decomposition of cellulose in non-saturated soils unless they are distinctly acid [*R.A.M.*, vii, p. 472] is substantiated.

MAGIE (R. O.). **Disease and insect control on Hops.**—*Bull. N.Y. St. agric. Exp. Sta.* 708, 20 pp., 4 figs., 1944.

A tabulated account is given of seven years' experiments (1937–43) in Oneida County, New York, to determine the most effective and economical methods of combating hop downy and powdery mildews (*Pseudoperonospora humuli* and *Sphaerotheca humuli*) [*R.A.M.*, xxi, p. 246; xxii, p. 40], sooty mould (*Cladosporium aphidis* Thuem. or a closely related species), and insect pests.

The best control of the two mildews on late varieties was secured by four applications of Bordeaux mixture 6.4-100 plus 4 or 5 lb. wettable sulphur dust, two treatments being given in June and two in July at 15- to 20-day intervals.

Red or yellow cuprocide and zinc sulphate-lime sprays at metallic concentrations of $1\frac{1}{2}$ –100 also gave very satisfactory results except as regards the protection of the cones against *P. humuli*. Copper-sulphur dusts, though not so reliable as Bordeaux mixture, are a useful adjunct to the latter when a serious outbreak of one of the mildews necessitates rapid action, or for early-season applications, when the ground may be too wet to support the weight of a spraying-machine. The dusts, moreover, may safely be used on the cones as a substitute for the Bordeaux-sulphur spray, which leaves an unsightly residue. In the case of early varieties, spraying should be begun about a week and concluded a fortnight earlier than on late ones.

Sooty mould and the associated aphid (*Phorodendron humuli*) on late varieties proved amenable to two applications of nicotine sulphate (1 in 800 or 1 in 1,200), the first coinciding with the last Bordeaux-sulphur treatment and the second (to which should be added $1\frac{1}{2}$ lb. laundry soap and $\frac{1}{4}$ lb. washing soda or 3 lb. potash fish oil soap per 100 gals.) just before harvest. The latter is seldom required on early varieties.

Sanitation was an important factor in the elimination of downy mildew in certain valley yards where early and rapid development of the disease is the rule. The removal and destruction of infected basal shoots during May and early June, before the sporulation of the fungus, retarded the appearance of severe symptoms by over a fortnight. Other preventive measures should include stripping the plant bases of extraneous growth, timely training of the young vines in an upward direction, the burning of mildewed debris as soon as the crop has been picked, and the eradication of 'wild' hops in the vicinity of the gardens.

CRANDALL (B. S.) & DAVIS (W. C.). **Cephaleuros virescens on Cinchona in Central and South America.** *Plant Dis. Repr.*, xxviii, 30, p. 926, 1944. [Mimeographed.]

The algal leaf spot caused by *Cephaleuros virescens* [*C. mycoidea*] has been observed on the Ledger variety of *Cinchona officinalis* and on *C. succirubra* in Guatemala, the former species also being attacked in Peru, while *C. pubescens* is infected in Colombia. The disease appears to be of no economic importance, but *Cinchona* may be noted as a new host for the alga.

CRANDALL (B. S.) & DAVIS (W. C.). **Occurrence of Cinchona root rots in the Americas.**—*Plant Dis. Repr.*, xxviii, 30, pp. 926–929, 1944. [Mimeographed.]

Investigations are in progress on the root rots of *Cinchona* in the Western Hemisphere, where little or no work has hitherto been accomplished on the diseases of this crop, interest in the cultivation of which is increasing at the present juncture. Two unidentified root rots have been reported by Kevorkian from Puerto Rico (*Rep. P. R. agric. Exp. Sta.*, 1941, pp. 9–10, 1942), one of which is characterized by symptoms resembling those of the 'grey root fungus' (*Rosellinia* sp.) described by A. Rant from Java (*Bull. Jard. bot. Buitenz.*, Ser. ii, 22, 22 pp., 1916). In the Western Hemisphere, *Cinchona* 'root and collar rot' comprises a complex of diseases in which species of *Phytophthora* would appear, from the external manifestations, to be largely represented. In the incipient stages of the disease the decayed tissues are chestnut-brown. Among the leaf symptoms associated with this disease group are a reduction in foliar density, very slight epinasty, increased reddening, and occasional dwarfing, while gradual defoliation accompanies the final phase.

In existing Guatemalan plantations, *C. succirubra*, commonly used as a stock for the Ledger variety of *C. officinalis*, appears to be generally resistant to endemic root rots, but it sometimes serves as a conductor of the agent of at least one such disease. Affected trees may be recognized by their sparse, reddish, somewhat

stunted leaves. The root-stocks of 14 out of 15 four- to eight-year-old trees suffering from this disorder showed a very narrow streak, often not exceeding 1 mm. in width, of infected cambial tissue extending between a root lesion and the graft union, while the Ledger scion bore a girdling canker connected through the union with the rotted streak in the root-stock. Some of the cankers reached a maximum distance of 3 ft. up the trunk before encircling it just above the graft union. Ledger trees on their own roots were also attacked by this presumably soil-borne parasite.

In Peru the mortality from root rot in a ten-year-old planting amounted to about 20 per cent. The infection evidently originates in the underground collar region and proceeds through the cambium for 8 to 10 in. above soil-level before girdling and killing the tree. The fungus responsible for this type of root rot appears to be quite virulent, having destroyed as many as three replants in some parts of the plantation. Both here and in Guatemala certain individuals seem to possess an inherent resistance to the diseases attacking them which promises well for the selection of stocks likely to withstand infection. Chemical analysis of the bark of the affected Peruvian trees showed that the quinine content approaches its maximum concentration at about the seventh year. Since most of the losses from root rot occur after this age, trees with even a moderate capacity for resistance might be grown to maturity on an economic basis.

Several plantings of the Calisaya variety of *C. officialis* on the eastern slopes of the Andes in the Department of La Paz, Bolivia, have been entirely destroyed by a root rot. The introduction of fragments of the diseased roots into unripe wild pineapples yielded cultures of a fungus with the hyphal characters of a *Phytophthora*. The inspection of four separate areas clearly pointed to faulty field practices as a contributory factor in the loss of the plants, which were placed in the bottom of holes 1½ ft. deep and 5 to 6 in. in diameter, where they became submerged during the rainy season, while the roots were unable to make normal growth in the impermeable subsoil.

WALKER (E. A.). **Diseases observed on Wormseed in Maryland.**—*Plant Dis. Repr.*, xxviii, 28, pp. 883–884, 1944. [Mimeographed.]

Wormseed (*Chenopodium anthelminticum*), widely grown in Carroll County, northern Maryland, for medicinal purposes, was observed in the course of a survey of 125 acres on 5th August, 1944, to be affected by wilt (*Fusarium semitectum* var. *majus*) and leaf spot (*Cercospora anthelmintica*), the maximum incidence of the former being 2 per cent. and of the latter 1.5.

EDGERTON (C. W.) & CARVAJAL (F.). **Host-parasite relations in red rot of Sugar Cane.**—*Phytopathology*, xxxiv, 9, pp. 827–837, 6 figs., 1944.

A study at the Louisiana Agricultural Experiment Stations of some host-parasite relationships in sugar-cane red rot (*Phyfalospora tucumanensis*) [*R.A.M.*, xxiii, p. 358] showed a typical internal lesion to consist of a white to straw-coloured centre with a red surrounding zone. In advance of the mycelium, the host cell protoplasm exudes a gummy material that fills the intercellular spaces, while at the same time a reddish pigment is produced and absorbed by the cell walls. The red zone constitutes a barrier to the progress of the invading mycelium and develops more rapidly in resistant varieties, such as Co. 281, than in susceptible ones. In cut stalks kept under warm, dry conditions the cells, no longer functioning normally, permit the unrestricted spread of the mycelium. In the stalk and leaf mycelial penetration is effected through the pits in the cell walls. Infection hyphae from appressoria were detected in the epidermal cell walls of the leaf sheath. Subcuticular acervuli develop from mycelium filling the epidermal and subepidermal layers, which sends minute hyphae through the epidermal cell walls;

these hyphae, after passing the cell wall, immediately begin to produce conidio-phores and setae between the wall and the cuticle, which is pushed up until it finally ruptures.

BAIN (D. C.). **The use of abrasives for inoculating Sugar-Cane seedlings with the mosaic virus.**—*Phytopathology*, xxxiv, 9, pp. 844–845, 1944.

Very encouraging results were obtained in inoculation experiments on two-month-old sugar-cane seedlings of the cross Co. 281 × U.S. 1694 at the Sugar Plant Field Station, Houma, Louisiana, with the mosaic virus by means of sand or carborundum [*R.A.M.*, xv, p. 737 *et passim*]. Four weeks after the operation, 44 and 42 per cent. of the seedlings abraded with sand and carborundum, respectively, showed mosaic symptoms, compared with 13 per cent. of those inoculated by means of Matz's needle-prick method [*ibid.*, xii, p. 660]. The latter technique, though usually 90 per cent. or more effective with susceptible varieties, is unduly laborious for the large-scale experimental work, involving the annual inoculation of 15,000 to 25,000 new seedlings, carried on at the Station.

Report on the British West Indies Central Sugar-Cane Breeding Station for the year ending September 30th, 1943.—41 pp., [? 1944].

In this report [cf. *R.A.M.*, xxii, p. 78] it is stated that sugar-cane mosaic is of paramount commercial importance in Jamaica, but of comparatively small commercial importance in Trinidad and the Windward and Leeward Islands.

In experiments on the artificial transmission of the disease a modification of the Sein method was used. A long strip of diseased leaf was cut, doubled in half, placed round the central unrolled leaf spindle of the healthy plant, and held between the thumb and forefinger of the left hand. The leaf was rolled tightly between the thumb and forefinger and then pinched, after which inoculation was effected in the usual manner, with a bunch of No. 000 insect pins thrust through a cork and projecting about $\frac{3}{8}$ in. Preliminary tests having demonstrated the satisfactory nature of this technique, inoculations of a large number of seedling crosses were carried out. From the results [which are tabulated] it is as yet too early to draw any conclusions, but the work is being continued.

GADD (C. H.). **Report of the Mycologist for 1943.**—*Bull. Tea Res. Inst. Ceylon* 25, pp. 24–31, [? 1944].

Poria hypolateritia [*R.A.M.*, xx, p. 137] still appears to be the commonest root disease of tea in Ceylon. No death has occurred since 1937 in plots treated in that year by the removal of every affected bush, with a ring of apparently healthy ones [*ibid.*, xvi, p. 634]. Evidence from a plot from which only obviously diseased bushes were removed in 1937, 1939, 1941, and 1943 indicates that losses will exceed the number of bushes that would have been removed had a complete ring of apparently healthy bushes been uprooted at the first treatment. Once a plot has been thoroughly treated, supplies may at once be planted without the use of a test plant.

Although weather conditions appeared exceptionally favourable for infection by *Cercospora theae* [*ibid.*, xviii, p. 821], only two cases were reported. The most serious injury occurred in a 'gum' nursery at an elevation of 5,500 to 6,000 ft., where about 6,000 young plants were killed; infection appeared to have originated in the leaves of old gum trees in the vicinity.

Possibly owing to abnormal weather, *Marasmius equicrinis* [*ibid.*, viii, p. 340] was more prevalent than usual on low-country estates. It gives tea-bushes an untidy appearance, but causes no ill effect. The conditions favouring it, however, also favour other fungi, some of which are parasitic, and particularly noticeable damage due to infection by another fungus may easily be attributed to the blight.

Empty bagworm cases (species unidentified) bearing numerous short lengths of the mycelium of *M. equicrinis* were received from a low-country estate.

In a report contributed by T. E. T. BOND it is stated that phloem necrosis [ibid., xxiii, p. 362] in the St. Coombs observation plots increased annually from 1939 to 1943 to 37.2 per cent. (average annual increase 5 per cent.) in the plots (677 bushes) and 14.0 (2.3) per cent. in the single rows (1,134 bushes). These figures are cumulative values for necrotic and suspected bushes together, and indicate the potential rather than the actual severity of the disease, many of the bushes remaining in average production for many years. The difference in rate of spread accords with expectation, the plots having been put down in relatively severely affected areas and the rows selected more or less at random for the survey. A plot of about 300 bushes on the Uva side, under observation since 1940, showed 11.2 per cent. increase in 1940 and 23.8 per cent. in 1943, representing an average annual increase of 4.2 per cent.

Observations confirmed the patchiness of the disease and strongly suggested that spread is both discontinuous, to bushes remote from the nearest infection centre, and continuous, i.e. from bush to bush. Rate of spread as determined in field plots will thus vary according to the size and position of the plot and the length of time the disease has been present therein. The figures for St. Coombs and Uva indicate a doubling in the percentage increase every three years or so, and this is believed to be fairly representative of necrotic areas at under 5,000 ft. elevation. At higher altitudes, the period of doubling may be under one year.

Experimental evidence demonstrated conclusively that complete roguing every six months reduced the potential rate of spread by at least two-thirds, while partial roguing was effective to some extent. Under field conditions, roguing is uneconomic, and the bushes believed to be necrotic should be removed only if they are regarded as non-productive, i.e., if the space occupied would be better filled by a healthy supply. The result does, however, confirm the existence of bush-to-bush spread, and demonstrates its relative importance as compared with random dispersal.

PRUTHI (H. S.) & SAMUEL (C. K.). **Entomological investigations on the leaf-curl disease of Tobacco in northern India. V. Biology and population of the white-fly vector [*Bemisia tabaci* (Gen.)] in relation to the incidence of the disease.**—*Indian J. agric. Sci.*, xii, 1, pp. 35–57, 1 pl., 5 graphs, 1942.

The biology of the white fly, *Bemisia tabaci*, the vector of tobacco leaf-curl [R.A.M., xix, p. 584; xxii, p. 197], was the subject of a five-year study at Pusa. A complete list of the alternate food plants of the insect is given, together with the times of year of its visits to them and its intensity. Many of these plants show symptoms closely resembling those of tobacco leaf-curl, and in the case of tomato, *Solanum nigrum*, *Crotalaria juncea*, *Ageratum conyzoides*, *Launia asplenifolia*, *Vernonia cinerea*, *Zinnia elegans*, *Sida rhombifolia*, *Euphorbia hirta*, and *Scoparia dulcis*, the same virus was shown to be concerned. The incidence of the disease in tobacco depends on the white-fly population, which reaches a maximum in the autumn, falls in the winter, and mounts again in March.

TERNOVSKY (M. F.). Методика селекции невосприимчивых сортов Табака к табачной мозаике и мучнистой росе. [Methods of breeding Tobacco varieties resistant to Tobacco mosaic and powdery mildew.]—*Всесоюз. научноисслед. Инст. Табачн. Махорочн. Пром. ил. А. П. Микояна (ВИТИМ)*. [The A. I. Mikoyan pan-Soviet sci. Res. Inst. Tob. and Indian Tob. Ind. (VITIM)], Krasnodar, Publ. 143, pp. 126–141, 1941. [Received December, 1944. English summary.]

The author outlines the methods of preparing the virus solution for artificial

infection, the mode and time of infection, and the manner of calculating the data used in his breeding work with hybrids of *Nicotiana glutinosa* and *N. tomentosiformis*, which showed a promising degree of resistance to tobacco mosaic and powdery mildew [*Erysiphe cichoracearum*: *R.A.M.*, xx, p. 89].

CLAYTON (E. E.), SHAW (K. J.), SMITH (T. E.), GAINES (J. G.), & GRAHAM (T. W.). **Tobacco disease control by crop rotation.**—*Phytopathology*, xxxiv, 10, pp. 870-883, 1 fig., 4 graphs, 1944.

The authors' conclusions as to the value of crop rotation in the control of tobacco bacterial wilt (*Bacterium* [*Xanthomonas*] *solanacearum*), stem rot (*Sclerotium rolfsii*), and *Fusarium* wilt (*F. oxysporum* var. *nicotianae*), have already been summarized from another source [*R.A.M.*, xxiii, p. 460].

LOJIKIN (MARY E.) & BEALE (HELEN P.). **A colorimetric method for the quantitative determination of minute amounts of Tobacco-mosaic virus and for the differentiation between some of its strains.**—*Contr. Boyce Thompson Inst.*, xiii, 7, pp. 337-354, 1 fig., 5 graphs, 1944.

The authors describe, with full technical details, a method of quantitative determination of minute quantities of tobacco mosaic virus by means of the Klett-Summerson photo-electric colorimeter, using the Folin phenol reagent (Folin et al.: *J. biol. Chem.*, xii, pp. 239-243, 1912; lxxiii, pp. 627-650, 1927), known to produce a characteristic blue colour in the presence of tyrosine and tryptophane. As little as 0.006 to 0.600 mg. of virus is needed for a determination. It is possible by this method to differentiate between those strains of the virus which differ in their tyrosine and tryptophane content.

KOTTE (W.). **Die Wildfeuerkrankheit des Tabaks in Deutschland.** [The Tobacco wildfire disease in Germany.] *Acta nicotiana*, pp. 401-404, Berlin, Verl. R. Gahl. [Undated. Abs. in *Ernähr. Pfl.*, xxxix, 3-4, p. 24, 1943.]

Tobacco wildfire [*Pseudomonas tabacum*] has been recognized in Germany since 1923, but the first virulent and widespread epidemic in the south-west dates from 1927 [*R.A.M.*, vii, p. 547]. At the moment the writer rates it as by far the most important disease of the crop, especially in seasons marked by a period of cold, wet weather shortly after planting out and a recurrence of similar conditions at the end of July to early August. Steam-sterilization of the seed-bed is an effective precautionary measure which is gradually winning favour in Germany, though the practice is attended by some difficulties incidental to the prevailing system of cultivation in smallholdings; it is, moreover, not free from various disadvantages, such as the intensified infestation of steamed soils by certain pathogens [cf. *ibid.*, xxiv, p. 71]. The best direct control of the disease in the seed-bed is afforded by the application of copper-containing sprays or dusts to the young plants, which may be continued, in conjunction with rational cultural methods, as a preventive in the field, where the question of direct control, however, no longer arises.

SIMONDS (A. O.) & KREUTZER (W. A.). **Infection phenomena in Tomato-fruit rot caused by *Phytophthora capsici*.**—*Phytopathology*, xxxiv, 9, pp. 813-817, 2 figs., 1944.

In a histological study at the Colorado Agricultural Experiment Station on the initial invasion of tomatoes by *Phytophthora capsici* [*R.A.M.*, xx, pp. 44, 336, 501] and subsequent development of the fungus in the host tissues, green fruits of the Landreth variety were inoculated with zoospore suspensions prepared by a specially devised method [see next abstract] and incubated for periods of two to 72 hours in moist chambers 25° C. Sections 12 to 20 μ thick from the infected

material were killed and fixed in formalin-acetic-formalin solutions recommended by Bass [*ibid.*, xx, p. 218], of which 'Graf' I and II gave the best results.

By two to three hours after zoospore germination large numbers of appressoria had been produced and given rise to invasion hyphae, which penetrated the cuticle, sometimes entering the epidermal cells directly, while in other cases they grew tangentially as far as the junction of two cells, whence radial ingress was effected. The latter mode of invasion, observed mostly in fruits beginning to turn pink, was apparently associated with the development of resistance in the cutinized wall. The distension of the outer tangential walls of the epidermal cells by the accumulation of underlying hyphae led to the rupture both of cells and cuticle and the emergence of hyphal masses through these channels. On inoculated fruits incubated for 72 hours the emergent hyphal agglomerations were macroscopically visible as mycelial mats, which were similarly observed on naturally infected material kept for 48 or 72 hours in moist chambers at 25°. Sporangia were plainly discernible in the smaller external hyphal growths.

Infection of tomato fruits by *P. capsici* took place more rapidly through the stylar than by way of the stem end. In general, tomatoes inoculated through the stylar end contracted infection in 70 to 90 minutes in 98 per cent. of the tests, whereas even after eight days' incubation there was frequently no evidence of the typical watery breakdown at the stem end, where it was replaced by small, sunken, rust-coloured, arrested lesions.

The comparative examination of sections from the stylar and stem ends of Landreth and Nebraska tomatoes revealed no essential differences in structure, apart from a thicker cuticle on the epidermal cells of the former, but the stem end cells contained three distinct types of crystals and small, non-plastid, globular masses which were absent from the stylar-end tissues. The three forms of crystals were (1) prismatic and apparently of the monoclinic or hexagonal system, (2) cubical in cross section and often elongated, and (3) raphide clusters. The failure of the invasion hyphae to spread through the subepidermal tissues of the stem-end suggests a connexion between the presence of the crystals or some accompanying chemical substance and the arrested-lesion type of infection. In fact, a correlation exists between the presence or absence of the crystals, whatever their nature, and the resistance or susceptibility of the fruit tissues tested [*cf. ibid.*, xv, p. 453]. In stained sections of the rust-coloured spots there was a deposit of reddish-brown gum in the epidermal and subepidermal cells, the latter often being completely disorganized.

KREUTZER (W. A.) & BRYANT (L. R.). **A method of producing an epiphytotic of Tomato fruit rot in the field.**—*Phytopathology*, xxxiv, 9, pp. 845–847, 1944.

The method devised for the laboratory inoculation of tomato fruits with *Phytophthora capsici* [see preceding abstract] involved the culture of the fungus at 25° C. on steamed barley in Erlenmeyer flasks for 20 to 60 days, after which the contents of each flask were passed through a food grinder and incorporated into the upper 3 in. of unsteamed field soil in a wooden flat. The soil was thoroughly watered, loosely covered with paper to prevent excessive transpiration, and turned with a trowel once or twice daily for aeration. By the end of 24 to 48 hours sporangia had developed in profusion, and after a further one to three hours samples of 1 cu. in. of the soil mixture in 30 ml. tap water were found to contain an abundance of zoospores, which caused rapid infection of the fruits at 25°.

For large-scale use 110 cultures of *P. capsici* grown for 60 days in 1-qt. milk bottles were ground and mixed with 1½ cu. yds. soil in a large wooden frame adjoining the trial field. The soil was duly aerated and moistened, and daily from the third to the eighth day a shovelful was placed in several 4-gal. glazed earthenware jars containing 1 gal. ditch water, drops of which, examined at half-hourly

intervals for three hours, were found to be filled with zoospores $1\frac{1}{2}$ to $2\frac{1}{2}$ hours after exposure at 75° to 85° F.

The prepared inoculum was spread thinly at the bases of the plants during irrigation, and shovelfuls were also placed at the edges of the running water at 25-yd. intervals in the furrows. An overhead sprinkler supplemented the furrow system of irrigation for the first three days after irrigation. The new method resulted in the uniform infection of tomato fruits in the whole of the field plots, bearing some 2,500 and 600 plants in 1942 and 1943, respectively.

ROBERTS (F. M.). **Factors influencing infection of the Tomato by *Verticillium albo-atrum*. II.**—*Ann. appl. Biol.*, xxxi, 3, pp. 191–193, 1944.

In continued studies on the *Verticillium albo-atrum* disease of tomato [*R.A.M.*, xxiii, p. 154], Kondine Red seedlings transplanted into 8-in. pots containing glasshouse compost or allotment loam were inoculated, when 10 to 12 in. high and developing the first flower bud, by settling the potted plants firmly in saucers in which a culture of the fungus was distributed between two layers of soil. Nutrient solutions were applied twice, one day after inoculation and again two days later, and contained the following amounts per plant: 1.325 gm. nitrogen (as sodium nitrate), 0.185 gm. phosphate (as sodium dihydrogen phosphate), and five doses of potash (as potassium sulphate) ranging between 0 and 3.232 gm. In the five potash tests, 15 or 16 out of 20 plants (or 77 per cent.) became consistently infected, indicating that, at least when the supply of nitrogen and phosphate is sufficient for good growth of tomato plants, potash has no effect on susceptibility to *V. albo-atrum*. When, in tests conducted at all seasons of the year, tomato plants receiving adequate supplies of nutrients were divided into three groups (the first having all the secondary shoots, flowering spurs, and terminal bud pruned, the second left unpruned, and the third having all but the youngest leaves stripped) and then inoculated 1, 10, 15, and 35 days after the first pruning, it was found that infection totals were considerably lower in the third group, ranging from 1 to 17 plants infected as compared with 5 to 63 and 5 to 67 in the first and second groups, respectively. This increased resistance to infection in plants with a reduced leaf-shoot ratio is attributed to reduction in the carbohydrate content of the host. The pruning of leaves not only reduced the number of plants that became infected but also the severity of the attack in infected plants, indicating that even after entering a plant the fungus is unable to maintain itself unless it is supplied with sufficient carbohydrate; it is suggested that this might explain the effect of shading in controlling the disease in plants already infected.

DAVIS (B. H.) & HAENSELER (C. M.). **Tomato seed treatment with new improved ceresan dust.**—*Phytopathology*, xxxiv, 9, pp. 847–848, 1944.

A simplified method for the treatment of tomato seed with new improved ceresan dust has been evolved at the New Jersey Agricultural Experiment Station, requiring a dosage of 0.5 per cent. by weight and five minutes' agitation of the seed. The treatment did not injure seed or seedlings, it prevented recontamination of seed held in cheesecloth bags by aerial micro-organisms for 28 weeks, and proved equally effective with the tedious dip method in the control of decay and damping-off. Composite samples of 40 lb. seed from four lots met the exacting requirements of the Georgia Department of Entomology and were planted in that State in the spring of 1944 to compare the relative efficiency of the dry and liquid methods. In tests with a commercial machine duster, of nine 100-seed samples from three treated lots, five were absolutely clean and the amount of fungal and bacterial contamination in any of the remainder did not exceed 2 and 1 per cent., respectively.

STRONG (M. C.). **Walnut wilt of Tomato.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xxvi, 3, pp. 194–195, 1 fig., 1944.

Tomatoes growing within an average radius of 50 ft. (maximum 80) from black walnut trees in Michigan have been observed to suffer from a wilt caused by a toxic chemical compound in the roots, which has been identified by E. F. Davis (*Amer. J. Bot.*, xv, p. 620, 1928) as juglone. The symptoms of the trouble include wilting of the tops, eventually spreading over the whole plant, and sometimes a brown discoloration of the vascular tissues; they begin to develop a month or two after planting, and by harvest time the crop is generally useless. A similar phenomenon has been reported by M. T. Cook [in respect of potato and tomato: *R.A.M.*, i, p. 320], by A. B. Massey in connexion with lucerne, potato, and tomato (*Phytopathology*, xv, pp. 773–784, 1925), and by F. J. Schneiderhan as affecting apple trees (*ibid.*, xvii, p. 529, 1927), while the writer was told in conversation by E. A. Bessey of the stunting of sugar beets within a 50-ft. radius of walnut and by R. Nelson of the death of asparagus and sweet cherry in a similar association.

BRETZ (T. W.). **Phloem necrosis of Elms in Missouri.**—*Plant Dis. Reprtr*, xxviii, 30, pp. 929–931, 1944. [Mimeographed.]

Phloem necrosis of elms [*R.A.M.*, xxiv, p. 80] having reached epidemic proportions in the St. Louis and Kansas City areas of Missouri, a survey was made of these districts which yielded the following information. In a single subdivision of St. Louis, some 150 10- to 15-year-old trees were observed in all stages of decline. Every trunk base and buttress root examined showed the characteristic 'butter-scotch'-yellow discoloration of the phloem, frequently accompanied by a faint but unmistakable odour of winter-green. A similar condition was typical of the 75 to 100 dying or dead trees included in the Kansas City inspection.

On pp. 931–932 of the same issue J. S. Tidd reports extensive mortality among elms in Indiana from a disease suspected of being identical with phloem necrosis.

SCHUSTER (C. E.) & STEPHENSON (R. E.). **Preliminary report on the use of B on Walnut trees (*Juglans regia* L.).**—*Rep. Ore. hort. Soc.*, xxxv, pp. 133–137, 1943. [Abs. in *Chem. Abstr.*, xxxviii, 10, p. 2435, 1944.]

'Snakehead' and die-back of Persian walnuts in Oregon appear to be associated with a deficiency of available boron in the soil, while a shortage of the same element may also be a cause of leaf scorch and leaf roll, the set of fruit and yield of nuts depending to some extent on the correction of the condition. The upper limit for safe application to 15- to 20-year-old trees on fairly heavy soils is 7 to 10 lb. borax per tree, incorporation in the soil being preferable to insertion into the bark or spraying. Two to four years may elapse before the beneficial effects of the soil treatment become apparent.

BAXTER (D. V.). **Pathology in forest practice.**—xi+618 pp., 178 figs., 26 diags., 14 graphs, 9 maps, New York, J. Wiley & Sons, Inc., London, Chapman & Hall, Ltd., 1943. [Received December, 1944.] \$5.50.

In a foreword to this treatise, S. T. Dana, School of Forestry and Conservation, University of Michigan, states that it 'is intended primarily for the student, the timber grower who is interested in the health of the forest, and the timber user who is concerned with the soundness of its products. It consequently pays little attention to the minutiae of taxonomy, mycology, and etiology, but attempts rather to provide a working knowledge of the conditions which cause disease and of the practical measures which can be taken to reduce its incidence or its severity.' The scope of the work may be indicated by the chapter headings, viz., I, plant disease, II, the fungi which cause disease, III, loss and appraisal of damage, IV, relation of nursery site and practice to disease incidence, V, relation of site and

cultural practice to disease incidence in plantations, VI, relation of site and cultural practice to disease incidence in the mature forest, VII, relation of fungi and certain other plant pests to disease in the mature forest, VIII, relation of site and care of shade and park trees to disease incidence, IX, handling and treatment of forest products in relation to decay and certain other defects, X, discolorations, stains, and molds in forest products. Chapter II comprises a non-technical key to the principal genera and species of the Agaricales likely to concern the forest pathologist, and each chapter is followed by a bibliography of the relevant literature.

CAVE (MARION S.). **Modification of procedure for differentiating the telia of *Cronartium ribicola* and *C. occidentale*.**—*Stain Tech.*, xix, 4, pp. 141–142, 1944.

The following shortened procedure has proved equally satisfactory with the original method of Acree and Goss for the differentiation of the teleutosori of *Cronartium ribicola* and *C. occidentale* [*R.A.M.*, xvii, p. 150] on the basis of a comparison of the two schedules for the examination of over 184 specimens in three seasons. A piece of *Ribes* leaf blade, 5 by 5 mm., bearing mature, ungerminated teleutosori, is excised and placed (teleutosori downwards) in a watch glass, covered with 2 ml. N/10 hydrochloric acid, and left for five minutes, whereupon it is rinsed in distilled water, immersed for ten minutes in the same, making two changes, blotted on filter or neutral blotting paper, placed on a slide under a dissecting microscope, the teleutosori teased from the leaf blade with a dull scalpel, allowed to dry for one to three minutes before adding a drop of 0.001 *M* brom phenol blue (P_H 7.6), and the cover glass set aside for twenty minutes before examination under the microscope. The spore contents (the matrix should be disregarded) of *C. ribicola* teleutosori turn blue and those of *C. occidentale* green.

FRACKER (S. B.) & BRISCHLE (H. A.). **Measuring the local distribution of *Ribes*.**—*Ecology*, xxv, 3, pp. 283–303, 5 graphs, 5 diags., 1944.

Ensuring, before or after the eradication of *Ribes* spp. against spread of white pine blister rust [*Cronartium ribicola*], that the *Ribes* in a stand are so few that they offer no threat to the trees, involves a systematic check of the stand and its environs. Checkers are usually required to cover either 4 or 5 per cent. of the land area under examination, and to report the number and location of the *Ribes* found. The present paper gives a detailed account of studies made to determine how accurately the sampling data obtained from a 4, 5, or 8 per cent. check indicate the specific unit areas on which the *Ribes* present are located, and to ascertain the extent to which these criteria are affected by raising the checking of records above 4 or 5 per cent. of the land area. Statistical evidence indicates, *inter alia*, that increasing the percentage of check makes possible a proportionate decrease in either the unit size of the plot or the minimum *Ribes* population class about which information is desired.

FRÖHLICH (J.). **Über den Befall der Fichte in den Ostkarpaten durch *Trametes pini* Fr.** [On the infection of Spruce in the eastern Carpathians by *Trametes pini* Fr.]—*Z. ges. Forstw.*, lxxv, 4–6, pp. 152–156, 3 figs., 1943.

Trametes [*Fomes*] *pini* is the most destructive pathogen of 100-to-300-year old spruces in the middle ranges (600 to 1,200 m. above sea-level) of the eastern Carpathians, involving 10 to 30 per cent. of the trees in mixed stands. The predominating species in the region are beech and fir [*Abies*], but the unmarketability of such a large proportion of the timber, even of the comparatively small spruce population, represents a substantial loss. Control measures, having regard to the vast extent of the affected forests, are quite impracticable, and the sole means of avoiding loss is to relegate the host to its natural habitat in the upper mountain ranges (1,200 m. above sea-level and upwards). The present policy of restocking the woods with spruces to replace those killed by the disease is quite indefensible.

BECKER (K. E.). **Zur Beizung kleiner Mengen von Gemüse und Gewürzsaaten.**

[On the steeping of small quantities of vegetable and condiment seeds.]—*Forschungsdienst*, xvii, 5, pp. 267–269, 1944.

A special method was devised at the Bernburg (Anhalt) Experiment Station to obviate the necessity for weighing the minute quantities of fungicidal materials required for vegetable and condiment seed treatment. It involves the admixture of 25, 50, or 75 per cent. talc with the material, which is then powdered over the seed for three minutes until a thorough coating is obtained, the excess being removed through a sieve. The seeds are germinated in quartz sand or on filter paper at 18° to 20° C. for the regulation periods prescribed for each kind by the Reich Union of Agricultural Research Institutes, with an additional reading of germinative energy three days after the final term and a count of germinative capacity interpolated between the 7th and 14th days. The percentages at which abavit, ceresan, fusariol, and germisan could safely be applied in this manner are presented in tabular form: they ranged from 0.25 (for kidney beans) to 1.4 (poppy [*Papaver somniferum*]), 0.32 (leek) to 1.4 (*P. somniferum*), 0.25 (bean and radish) to 1.4 (*P. somniferum*), and 0.32 (leek) to 1.4 (*P. somniferum*), respectively, the corresponding figures for cereals being 0.8 (barley and wheat) to 1.4 (oats) for abavit and 0.2 (barley, wheat, and rye) to 0.3 (oats) for the other three preparations.

Service and regulatory announcements. List of intercepted plant pests, 1943.—

S.R.A., B.E.P.Q., U.S. Dep. Agric., 35 pp. 1944.

Pathogens intercepted on plant material entering United States territory during the period from 1st July, 1942, to 30th June, 1943 [*R.A.M.*, xxii, p. 416], included *Cercospora musae* [*Mycosphaerella musicola*], again detected on bananas from Honduras [loc. cit.], *C. personata* on groundnuts from Mexico, *Claviceps paspali* on *Paspalum dilatatum* from Australia, *C. purpurea* on *Lolium* sp. from Uruguay, *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] on rice from Salvador and *Nigrospora oryzae* on the same host from India and Portugal, *Monilinia cinerea* [*Sclerotinia laxa*] on cherries from Portugal, *Myrothecium roridum* on *Agave* sp. from Mexico, *Phoma terrestris* on parsnips from England, *Phytophthora capsici* on chilli, *Pseudoperonospora* on squash (*Cucurbita maxima*) and *Pythium aphanidermatum* on string beans from Mexico, *Sphaceloma perseae* on avocado from the American Virgin Islands and Jamaica, and *Vermicularia* [*Colletotrichum*] *capsici* on tomato from Colombia.

Distribution maps of plant diseases.—Maps 49–72. Issued by the Imperial Mycological Institute, 1944. 3s. 9d.

The third year's issue of this series of maps showing the world distribution of major crop diseases [*R.A.M.*, xxiii, p. 80] comprises (No. 49) groundnut rosette virus on groundnut, (50) *Sclerotinia fruticola* on plum, peach, apricot, cherry, etc., (51) *Piricularia oryzae* on rice, (52) *Rhizoctonia pseudotsugae* on *Pseudotsuga taxifolia*, (53) *Phoma citricarpa* on citrus, (54) *Fusarium conglutinans* on cabbage, broccoli, cauliflower, etc., (55) *Elsinoe australis* on citrus, (56) aster yellows virus on *Callistephus chinensis*, lettuce, etc., (57) *Xanthomonas malvacearum* on cotton, (58) *Coccomyces hiemalis* on cherry, (59) *Cercospora coffeicola* on coffee, (60) peach yellows virus on peach, (61) *Gymnosporangium juniperi-virginianae* on apple and *Juniperus*, (62) *Phytophthora fragariae* on strawberry, (63) *Alternaria longipes* on tobacco, (64) *Corticium koleroga* on coffee, citrus, etc., (65) citrus psorosis virus on citrus, (66) *Endothia parasitica* on chestnut, (67) *Corynebacterium insidiosum* on lucerne, (68) *Melampsora lini* on flax, (69) *Sorosporium reilianum* on maize, sorghum, (70) *Phytophthora cambivora* on chestnut, beech, maple, etc., (71) *Cercospora oryzae* on rice, and (72) *Didymella applanata* on raspberry and loganberry.